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I INTRODUCTION

A. Purpose of the Report

IBM has announced a major program to provide a coordinated, cogent software environment across its hardware systems. This major program is known as Systems Application Architecture. It has the long range growth perspective of the IBM corporation as a major objective and has presented the Information Services industry with yet another approach in how to evaluate IBM's direction.

As IBM dominates the computer industry it is important that DRUT review the SAA concept and provide its client base with some insight and perspective. This report analyzes SAA (as of the Q2 1988) and provides a summary of the current snapshot of SAA and its impact on the market

B. Scope

The report reviews the current status of SAA and provides insight into possible future directions. The report is organized in the following fashion:

- Chapter I is the Introduction describing the report contents, purpose, scope and general overview.

I INTRODUCTION

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IBM has announced a major program to provide a coordinated, cogent software environment across its hardware systems. This major program is known as Systems Application Architecture. It has the long range growth perspective of the IBM corporation as a major objective and has presented the Information Services industry with yet another approach in how to evaluate IBM's direction.

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B. Scope

The report reviews the current status of SAA and provides insight into possible future directions. The report is organized in the following fashion:

- Chapter I is the Introduction describing the report contents, purpose, scope and general overview.

- Chapter II is the Executive Overview which is designed to provide the interested yet hurried reader with an overall summary or view of the report

- Chapter III through IV examine the background, the SAA definition, issues, trends and directions of the SAA program

- Chapter V offers conclusions and recommendations on how to view SAA and benefit from its broad acceptance.

C. Methodology

This report is based on primary research performed by IDC ~~calling~~ interviewing on 20 vendors of software products, major hardware manufacturers competitors and several end users

In addition ~~a~~ secondary sources and materials ~~and~~ were used to provide an insight and perspective.

Finally several IBM document were reviewed and comments from leading IBM spokespersons studied to ~~found out~~ develop the overall perspective of IBM's own directional and announced statements.

D Use of the Report

This report can be used by those individuals responsible for understanding the major directions and driving forces in the Information Services Industry. Such individuals involved in marketing, selling, planning and product development will benefit from the comprehensive coverage of SAA in this report.

Readers will be able to determine how the SAA concepts and program unfurled by IBM will impact their company's impact and response to SAA. The formal announcement of SAA places the computer industry on notice that IBM will (and is) compete more effectively in the ~~future~~ future.

~~SAA Difference~~

E
~~B~~. General overview

Systems Application Architecture (SAA), is a recent development program within IBM to offer a congruent collection of software interfaces, conventions and protocols to provide a framework for application systems across the expansive hardware offerings of the IBM Corporation.

Prior to SAA, the IBM corporation hardware/software in the 3 tiers of micro, mini and mainframe were largely incompatible with different operating systems, programming language variations, systems tools and application capabilities. Thus when a user desired to expand operations or add additional functionality a major conversion was required.

The basis for the apparent difference in hardware/software architectures is ~~tag~~ based on the desire of the IBM corporation to provide the maximum price/performance ratios for each of the major tiers. This necessitated different hardware characteristics which in turn placed unique requirements on operating systems developments which in turn led to subtle differences in compilers, languages, ~~systems~~ application enabling tools, etc to complement the unique hardware.

This ~~is~~ further led to application implementation differences meaning the same application could not run on different tier hardware without a significant effort. This was true inspite of an application using

the same language as the data structures and formats were considerably different across the tiers. This also meant that application developers had to consciously decide which tier to target their development, sales and marketing ~~efforts~~ and all other company activities that support the vendor's business pursuit.

II Executive overview

A. SAA - WHY.?

IBM has responded to competitive forces in the market that were capitalizing on niches of opportunity in what it perceived to be their natural market in workstations, Sun, Apollo, DEC and H.P were making inroads; in supercomputers: Cray was carrying the day; in supermini/minisuper companies like Alliant, Convex and Multiflow are having an impact; in UNIX systems UNISYS and NCR were making significant progress and last and the most DEC was eating IBM's lunch in the mid-range or departmental systems.

IBM's initial response was the 9370 which did not make much of an impact.

IBM also responded, on what seems a short timeframe, with Systems Application Architecture as a means of unifying all the disparate IBM platforms. This was due to the detrimental fact that users were buying DEC VAX solutions because their application investment was preserved as they upgraded their hardware. Exhibit II-1 provides additional reasons for SAA.

B. SAA - WHAT.?

Exhibit II-2 describes the major elements of SAA. These elements are:

Exhibit II-1

Reasons for SAA

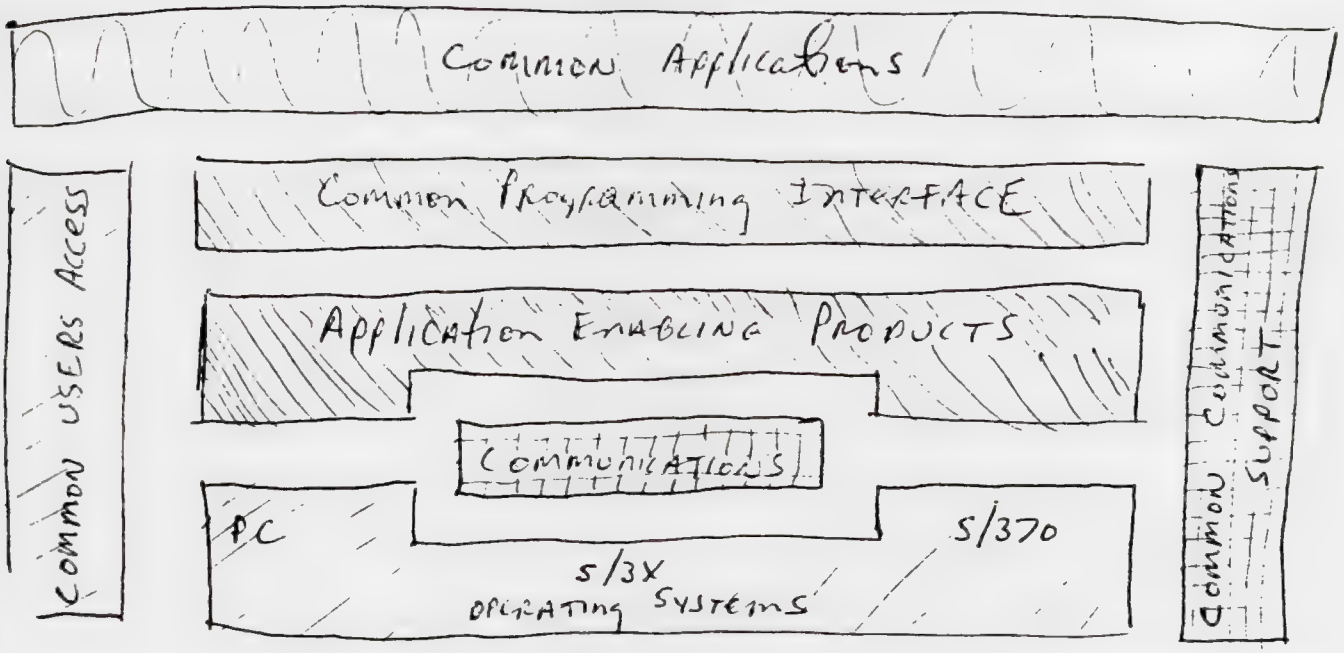
- DEC success with migration strategy
- CHANGING BUYER PATTERNS
- Software - fastest growing part of IBM
- Slowdown of mainframe purchases

II-15

Exhibit ~~III~~

SAA - WHAT IS IT.[2]

IBM Systems Application Architecture =
SAA APPLICATION



- Common Programing Interface providing languages and tools for application development.
- Common Communications Support providing tools and interfaces to allow IBM ~~the~~ platforms to communicate with each other.
- Common User Access provides conventions and standards to describe screens, support user interaction and hardware layouts of keyboards
- Common Applications providing IBM delivered and supported applications

C. SAA - When?[2]

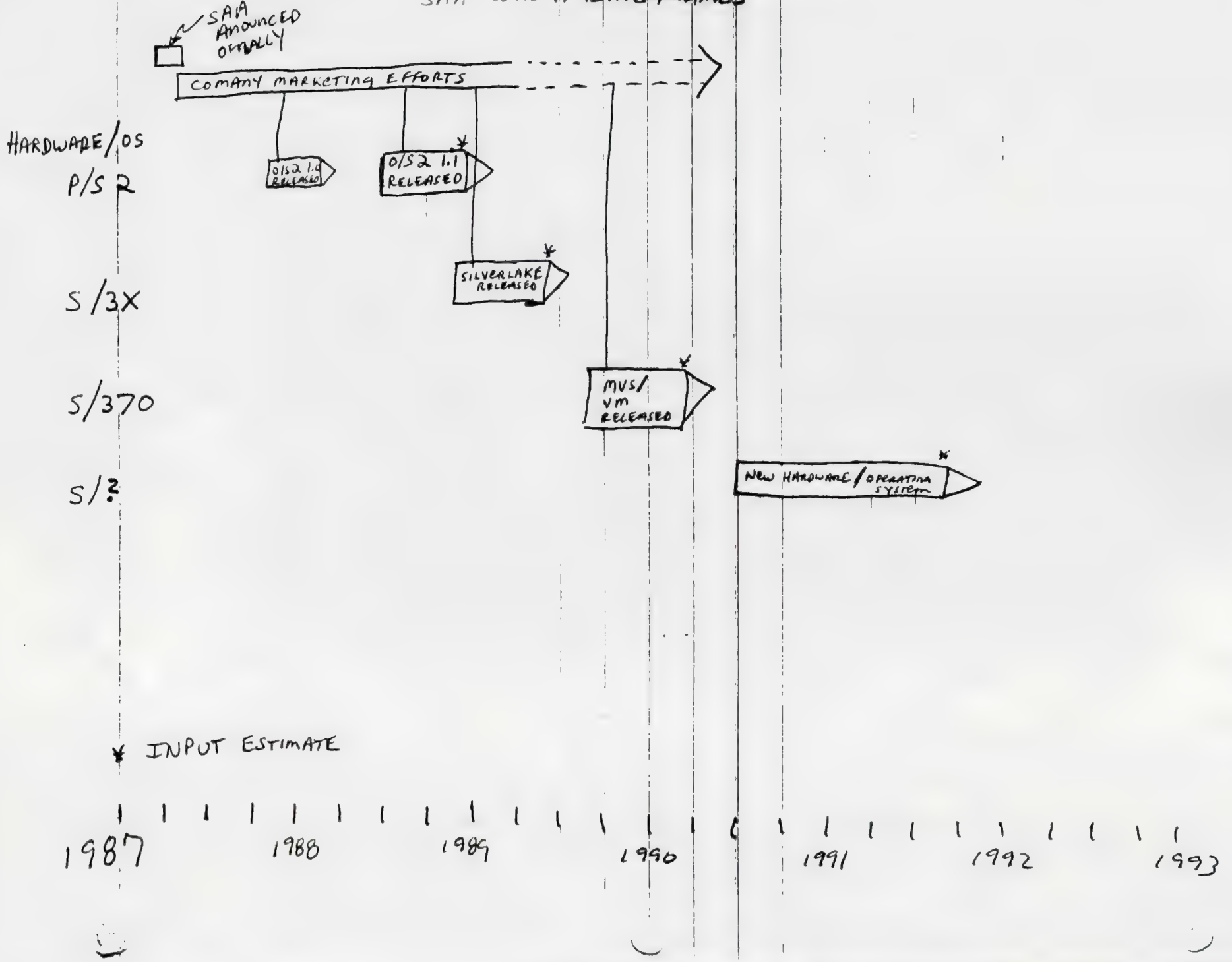
The first clear and distinct examples of SAA will be in the summer of 1988 when OS/2 Extended and Silverlake are shipped. These will provide insight to how SAA will unfold in the next few years. Exhibit II-3 provides a timetable for ~~the~~ when the different platforms will have their initial SAA-compliant thrust. (Note: the left portion of the bullet signifies IBM's estimate for when that functionality will occur for the first time)

Also it should be noted that IBM believes a next generation hardware is under wraps and will be ~~available~~ available mid-1990 announcement.

Exhibit II-3

~~SAA~~ ~~HARDWARE~~, ~~OPERATING~~ SYSTEM

SAA - WHEN: ~~TIME FRAMES~~



D. SAA - ISSUES

SAA is an ambitious undertaking and one that will have a major impact on IBM itself, independent software vendors and users as such there are a number of issues that are unresolved as SAA has not been definitively designed. Much like SNA has evolved over the past 18 years it is expected that SAA will evolve. However Input believes the timeframe is more likely to be 3-5 years before essentially steady state is reached.

SAA was not conceived and designed over a protracted period of time resulting in papers in the IBM Systems Journal and presentations to major clients prior to official announcement. Thus there are some holes in the announcement and these holes are subject to being plugged. Exhibit II-4 lists some of the issues raised by the introduction of SAA

IBM has formed an Applications Systems Division that will be a key factor in its ability to deliver application solutions. IBM will develop some solutions internally focusing on cross-industry and ~~large~~ industry-specific application in large the large or faster growing industry segments.

Input does not believe that SAA is marketing hype based on the amount of senior management involvement and development resources being deployed to implement SAA. ~~Re recent elevation of status of ASD said~~ The recent

Exhibit II-4

SAA ISSUES

- IMPACT on SOFTWARE INDUSTRY
- USER Acceptance/Benefits
- IMPACT OF ASD
- MARKETING HYPE?
- CAPABILITY SHORTFALLS

creation of 2 new lines of business called Application Solutions and Programming Systems elevates the importance of software within the IBM Corporation

E. Conclusions

The announcement and implementation of SAA will have a noticeable impact on the software industry. IBM has set new ground rules for application systems that will cause more competition, better functionality and likely lower prices. While SAA may have been imperfect in its totality those vendors who do not analyze and determine how to coexist may face difficult times. Exhibit II-5 describes some of the conclusions DATAQUEST has reached in looking at SAA and its impact on the market. There is no doubt that IBM is using SAA as a means to maintain dominance in the software market and increase its penetration in application software/systems ~~and~~ an area that has not been as successful as systems software.

Exhibit E

SAA Conclusions

SAA WILL:

- DRIVE PRODUCT CONSOLIDATION
- BE A USER REQUIREMENT
- DRIVE NEW APPLICATIONS / PRODUCTS
- DRIVE SOFTWARE PRICING
- RE-SHAPE THE SOFTWARE INDUSTRY

III SAA Background, Definition and Concepts

A WHY SAA?

Systems Application Architecture is a response by IBM to several major factors that were occuring in the competitive marketplace. These factors are:

- the successful penetration of Digital, Hewlett-Packard and UNISYS in the mid-range computing environment.
- the slowdown of the large mainframe, centralized approach to computing caused by the acceptance of the micro and mid-range computing environments
- the initial ~~success~~ success of the so-called portability of software across several hardware platforms by its competitors
- the awareness that the software and services portion of IBM is the fastest growing and most profitable portion of IBM's business.
- the changing purchasing patterns of major corporations wherein authority is shifting to the outlying divisions to provide application systems pertinent to running the business.
- the ~~smooth~~ competitors migration strategy offered by IBM's

While some of the above factors are interrelated

they all, in some fashion, are reasons for the concept of SAA as a competitive thrust by IBM to attempt to maintain control over its major accounts and re-assert its dominance in the industry.

Exhibit III-1 shows the IBM corporate financials for the past few years in terms of several business segments. It is clear the fastest growing and most profitable business segment is software and services. Similarly the portion of the business accounting for hardware sales is growing lackluster and corporate profits have not kept up with the spectacular growth of the early 1980s.

Part of IBM's success in the early 1980s was the growing performance and applications requirements of IBM's customers fueling a significant growth in large main frame environments with heavy DASD (Direct Access Storage Device) requirements. When the computer industry slump of 1984, 1985 hit the mainframe business was largely impacted. The re-awakening of the industry in 1986 occurred mostly in the mid-range and micro-~~computer~~ range (workstations included) as the purchasing authority shifted to the outlying divisions and departmental groups.

This shift occurred due to the localized need to have adequate computing resources to perform

the business functions of the work group. It also meant there were new buying points in the organization who were less likely to be true blue and more concerned with price/performance issues as well as upward migration paths.

IBM had no easily identifiable migration strategy for any of its clients and it was generally well understood that a shift in hardware caused by growth of business or an increased application portfolio necessitated a major conversion on the part of the customer. This was viewed as the price of success so to speak.

This migration process while understood was offensive and unproductive. However IS managers were able to convince their management this was a necessary and acceptable event. This helped the IS manager increase its importance in the organization in terms of additional headcount and budget requirements.

In the 1984 timeframe several of IBM's competitors that had fashioned niches in certain smaller segments of the market such as DEC in engineering and scientific, HP in manufacturing (order entry and MRP) and UNISYS in banking became more proactive about penetrating additional commercial segments.

Simultaneously smaller divisions and workgroups

became active in solving their application needs and they were effectively sold on the mid-range computer systems due to ~~their~~ the mid range systems ability to coexist and communicate with the IBM mainframe as well as offer an upward migration path free from conversion turmoil and hassle. The so-called end user purchasing authority had no inborn sense of loyalty to "Big Blue" and therefore was not "true blue".

This resulted in significant growth and penetration by DEC, HP and others in the mid range with the associated profitability that generally results from such growth. This further resulted in these ~~,~~ computer, public stocks prices rising as the Wall Street, investment market research firms ~~or~~ noticed the success of these companies and the fundamental changes in the market.

This lead in DATA's view to the two major announcements of Systems Application Architecture and Application Systems Division. SAA and ASD are very related to the future success of IBM as it attempts to maintain account control in its major customer set.

SAA describes an applications environment that speaks to the major upgrade and migration strategy of the workgroup, departmental and mid range computing groups. SAA is a major investment on the part of IBM to coalesce a strategy that builds upon SNA while cleverly changing the focus of the platform

interaction from mainframe master to connection slave to a more peer to peer relationship.

ASD is the major marshaling of IBM's resources and forces to provide applications ~~and~~ from IBM itself as well as be a focal point and catalyst for 3rd party application vendors. Thus ASD will have a mission of providing significant ammunition to the arsenal of SAA. ASD will be discussed in greater detail in the section on IBM's commitment (see chapter _)

B. What is SAA.?

II D ~~Introduction~~

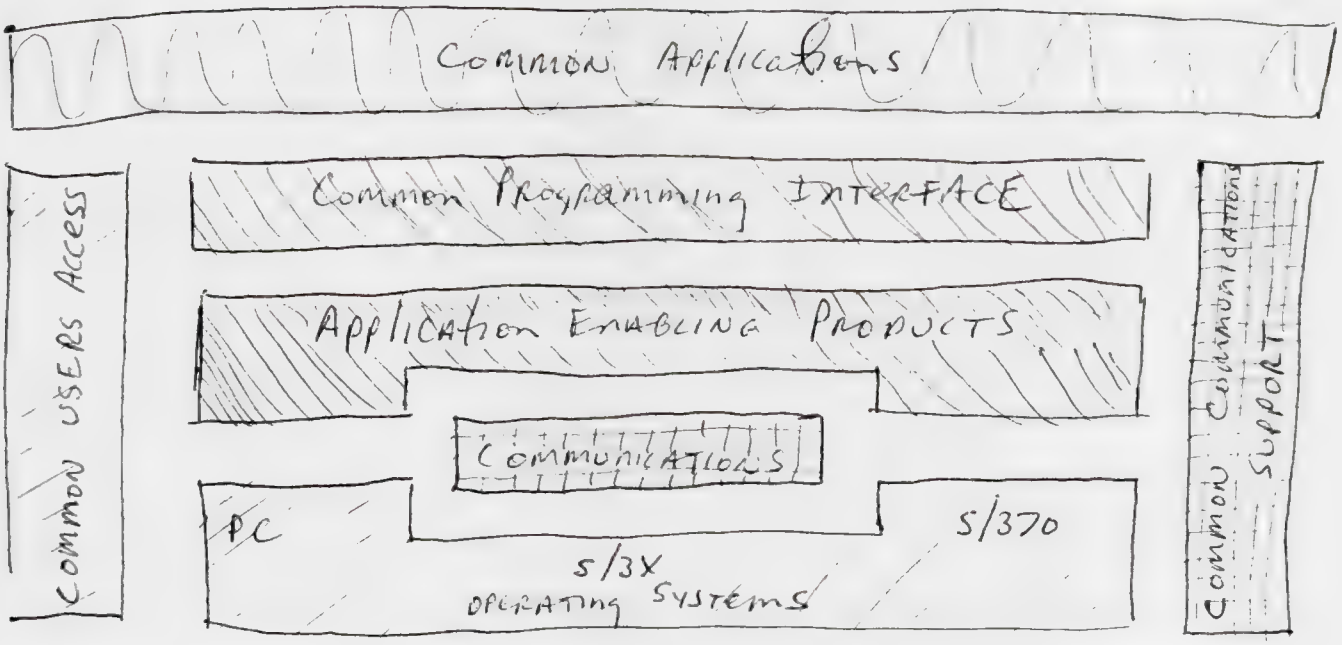
IBM SYSTEMS Application Architecture is comprised of four distinct elements that provide an environment for applications in each of the major hardware platforms across all IBM hardware environments instilling a singular look and feel. These elements are graphically depicted in exhibit III g-2 and are known as the following:

- Common Programming Interface
- Common Communications ~~&~~ Support
- Common User Access
- Common Applications

In the succeeding ~~chapters~~ pages in this report Input will discuss each of the common elements desiribing their ~~the~~ goal and functionality. In addition Input will provide perspective to the SAA concept discussing such factors as the issues, benefits, competitive ~~&~~ ~~nature~~ views, product timetables, shortfalls or needs and IBM corporate

Exhibit III-2

IBM Systems Application Architecture - Organization



commitment.

There are many ramifications to SAA from the impact on IBM itself, to the 3rd Party software vendors and independent software vendors to the end user community as well, not to mention the impact on IBM's competitors.

For if IBM is successful and timely in its SAA capabilities there is no doubt that its competitors will have a more difficult time positioning themselves against IBM. SAA is an ambitious undertaking which has been underway for more than a year (at this writing). There are no tangible examples of SAA and thus there is much conjecture about the "SAA reality" or marketing

hippo. The rest of this document will discuss the pros and cons of SAA and draw some conclusions on the "SAA reality". The next few pages describe SAA's 4 major interfaces.

1.) Common Programming Interface

The Common Programming Interface is the programming logic core of SAA. It consists of two general types of programming elements:

- Languages
- High-level programming tools
- Screen and peripheral managers
- 4th generation applications generator
- Services

The main elements are detailed in exhibit III-3 and III-4 describing Languages and Services respectively. It should be noted that the specific program products selected all exist in current significant implementation on at least one hardware platform in a particular operating system. [Note: As will be mentioned in other sections SAA is an amalgamation of existing application programming/enabling tools as well as communication products/capabilities from SNA] There fundamentally is nothing "new" in SAA.

a.) Languages

The languages chosen to be included in SAA are Fortran, Cobol and C. Fortran and Cobol are fairly obvious and straightforward as they have been key languages in IBM's user environments

(K)

SAA – Common Programming Interface Languages

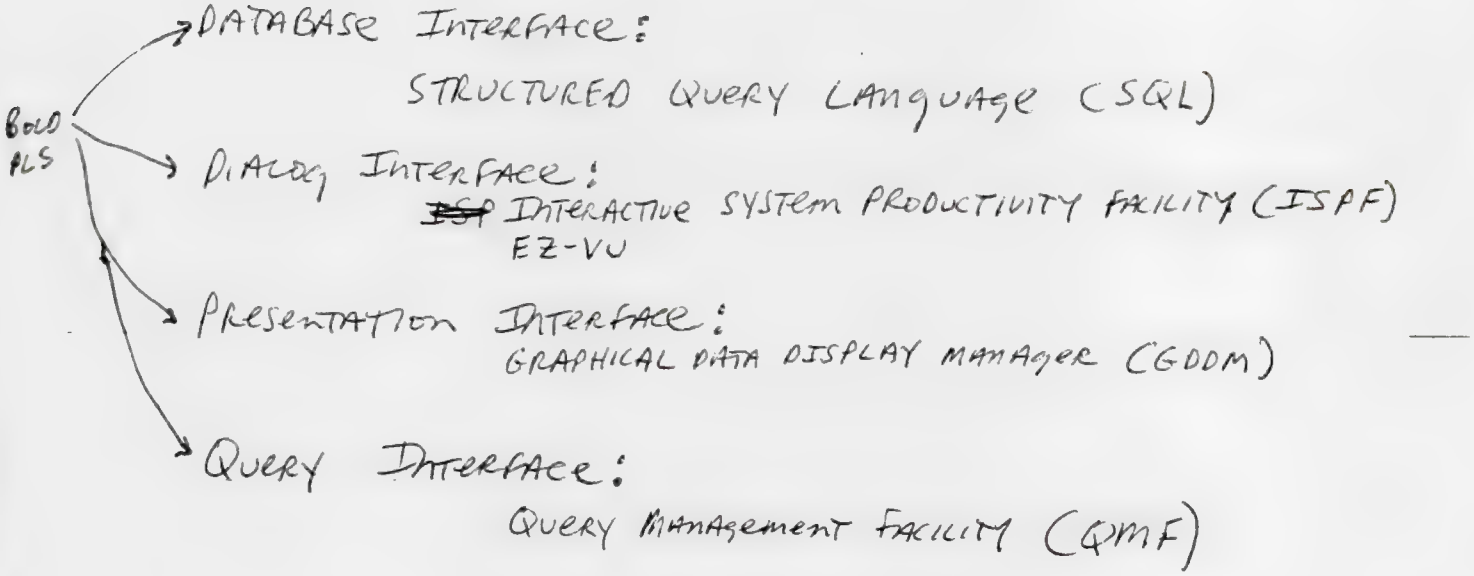
- Programming Languages:
  - COBOL
  - FORTRAN
  - C
- Application Generator:
  - CROSS SYSTEM PRODUCT (CSP)
- Procedures Language:
  - ~~REXX~~
  - Restructured Extended Executor (REXX)

bold pts

Exhibit III-4
~~CFI-2~~

(2)

SAA - Common Programming Interface Services



for many years. The choice of C, however, could be considered a surprise as it is a relatively new language and one that is not natural to IBM's traditional thrust. While very little has been mentioned regarding the choice of C versus including PL/1 or C++ it is INPUT's view that C was chosen for 2 main reasons:

- C is becoming more and more a language of choice for those independent software companies that desired so-called portability in the micro through mid-range
- IBM is ready to make an assault on the UNIX market which requires C capability
- The trained computer science oriented college graduates are trained in C as part of their curriculum and seem to be predisposed toward its robust functionality and flexibility.

ii) COBOL

Exhibit III-5 depicts the ANSI SAA languages and their ANSI compliance. The COBOL language within SAA will be the Intermediate Level with some elements from the same standard - High Level. In addition due to IBM's EBCDIC data interchange code the special requirement of COMP-3 and Comp-4 data elements are required.

It is IBM's belief that the Cobol implementation will be ample and satisfactory to provide programmers with a familiar dialect of Cobol allowing the vast majority of existing Cobol programs to be run within SAA. In addition IBM believes it will be relatively simple to port Cobol programs from other hardware manufacturers to the SAA Cobol environment.

(iii) Fortran

The Fortran selected for SAA is based on Fortran 77 (ANSI X3.9-1978) which also is ISO standard 1539-1980. In addition IBM will implement several enhancements to the Fortran-77 such as long variable names (up to 31 characters).

As in Cobol, IBM believes its Fortran implementation will be familiar to most Fortran programmers and will allow existing IBM platform Fortran programs and support other hardware vendors source code as it is ported to the SAA environment.

III-5

SAA Language ANSI Compliance

COBOL	ANSI STANDARD X3.23-1985 (ISO Compliant) Intermediate level, some elements from High Level and necessary IBM enhancements (Comp-3 and Comp-4
FORTRAN	ANSI STANDARD X3.9-1978 (FORTRAN-77)
C	ANSI STANDARD - X3J11

iv) REXX

ReXX is currently available in the VM operating system and is known as the SYSTEMS Product Interpreter. It is a procedural language familiar to VM/CMS users reputed to be straightforward and simple to use for E computer professionals and casual users.

The main design concepts of REXX are to ~~its~~ provide program readability, system independence, natural data typing, symbolic manipulation, dynamic data creation, easy to learn, and capable of being used for applications and/or utilities needs

ReXX is the ~~cap~~ programming capability to perform commands files, parse system commands and develop macros to provide a systems language to the environment.

v.) CSP

Cross System Product is IBM program product (#5668-814) which is available in MVS and VM environments. CSP ~~is~~ has not been a resounding success up until now with many IBM mainframe users opting to use 4GLs from independent software vendors. An application

generator is an application enabling tool designed to build certain types of programs without having to employ a traditional 3rd generation language or without having to become involved with system details.

Application generators generally include some of the following features:

- fill in the blanks development environment
- interactive syntax checking
- tutorials, help and prompting facilities

Independent software vendors products that have had considerable success in the market are listed in ~~CPI-4~~ III-6

It is Input's view that CSP may get a better play in the market based on its participation in SAA but is unlikely to make major inroads against the formidable competition in Exhibit CPI-4. unless the version on the PS/2 becomes more functional and competitive. ~~with~~

(1)

III-6

Exhibit ~~CPI-4~~

Successful Application Generators/4GLs

FOCUS	Information Builders
NOMAD2	MUST International
RAMIS	Online Software International
MANTIS	Cincom
IDEAL	AMERITECH (ADR)
NATURAL2	SOFTWARE AG

b.) Services

The Services content of the Common Programming Interface are elements that specify interaction either between ~~other~~ program elements or with the user-oriented input/output. These services are definitions or specifications detailing how modules or programming logic communicate on a functional level to pass information between the user and executing processes or between two processes themselves.

These Services effectively become standard ways that program or application developers can control environments and assure consistency. Many of the Services are internal standards to IBM with the exception of SQL which is an ANSI standard.

The important factor to consider is that the Common Programming Interface specifies a consistent programming and interfacing environment which will be used by independent software developers as well as IBM to develop applications suitable for all the systems produced by IBM

i) DATABASE Interface

The Database Interface allows program modules to define, retrieve and manipulate information in a relational database. The name of the interface

is the Structured Query Language (SQL). SQL is a non procedural language which allows programs or users to specify what they want done without a concern as to how it will be accomplished.

SQL is straightforward and reasonably easy to use and remember. There are built in functions and operations that allow the most complex interactions with the data base to be undertaken without the development of complex programs. SQL can be ~~sent to~~ used either interactively or in a batch fashion i.e. submitted immediately or under program control.

SQL was developed as a complementary tool to the relational databases and is currently an ANSI standard. This facilitates the capability to interact with data that can easily be accessed and managed due to the special flexibility available in the relational algorithms.

The SQL included in IBM's SAA is compliant with ANSI standard X3.135-1986. This SQL is almost identical to the SQL support in IBM's DB2 and SQL/DS, families licensed programs to System/370 users. A data base manager facility has been announced for OS/2 which is scheduled for July 1988. Ingot believes that

By late summer IBM's release OS/2 1.1 extended will provide SAA support. Even if IBM itself does not provide SAA support there will be numerous vendors offering SAA support such as Microsoft, Ashton-Tate, Lotus and SYBASE and Gupta Technology.

ii) Dialog ~~Services~~ Interface

Dialog interfaces are necessary to assist programs/application developers in producing interactive applications. The predominant emphasis is on displaying and controlling the user's interaction with the application. The type of functionality offered is to ~~~~ standardize menu selections, help information request and message output. In addition the Dialog Service will be responsible for providing a consistent vehicle for the user to interact with the application for data and function requests.

This user/application interaction can be viewed as a convenient, easy-to-use extension of the operating system. This facilitates the programmer in providing functions such as input field validation, message input/output and help/tutorial features.

By providing Dialog Services SAA allows the user/programmer interaction to become hardware device endependent. As part of SAA it ensures that the use/program interaction is consist across all of IBM's hardware platform.

The major bases for Dialog Services is available in the mainframe program product Interactive System Productivity Facility (ISPF Version 2, Release 3) for MVS and EZ-Vu ~~for~~ from PC-DOS. ~~For~~ for the PS/2, IBM will provide a Dialog Manager as part of OS/2.

(iii) Presentation Interface

Presentation Interface is an additional service for the programmer developer that allows consistent routines for how information is to be displayed or printed. ~~The significant difference between Presentation Interface and Dialog Interface is~~ The functionality provided by the Presentation Interface is ~~to monitor the windows approach, support~~ as follows:

- Monitor and control the user interaction and display from a presentation or the screen perspective this would be in concert with the conventions and specifications set out in the Common USER

Access / SAA

- ~~provide~~ control the graphics support capabilities of the display managing image, data and text,
- manage the fonts and character set requirements supported by the display
- Manage the device driver support for various output devices such as ~~displays~~ printers and plotters as well as the display output.

The ~~major difference~~ Dialog Interface and Presentation Interface are concerned with similar needs of the application programming system. This is the requirement to control the interaction of the user with the application system. The Dialog Manager controls the local interaction on how individual data elements are presented, typed, and interfaced to the application ~~from~~ a data value content point of view while the Presentation Manager is involved in the overall look and feel of the output be it to a display, printer or plotter

IBM will be using for the graphics portion of the Presentation Interface the existing System/370 Graphical Data Display Manager - (GDDM). This is a familiar interface to MVS and VM users.

In the OS/2 environment IBM is slated to use Presentation Manager being developed by Microsoft. However the recent legal suit by Apple to prevent ~~IBM~~ Microsoft and Hewlett Packard from exploiting the "look and feel" of its icon-based graphical interface may place a damper on an early release of Presentation Manager.

The major claim of Apple is that the "look and feel" of the Macintosh interface is copyright(able) and other vendors can not use a similar ~~look~~ look in their interface without ~~paying~~ a licensing arrangement. This issue has stirred up the computer industry and its outcome will not ~~be~~ be settled until near the end of 1988. In the meantime noone is slowing down their PS/2 development activity and Microsoft and IBM claim to be agressively continuing with their joint plans. If the Apple suit is judged to have merit ~~their~~ there would be a significant monkey wrench thrown into the concept of standardization ~~in~~ and ~~consistency~~ consistency for the output devices closest to the user i.e. printers, screens and would defeat a part of the SAA concept.

iv) Query Interface

The Query Interface is used to assist in developing query and report writing services to take data from a relational data base (i.e. query) and structure reports using the data extracted.

Query and report writing in this context is highly interactive. The approach of these services is to use a menu-interaction technique to develop a report structure to produce the report. This sometimes is called "Query by example" and saves the user from formally having to write a computer program to produce the desired result.

The Query Interface of the Common Programmer Interface of SAA will be based on the current IBM program product available to System/370 users called QMF - the Query Management Facility. As one would expect the actual query statement format would be based on SQL as described in the DATABASE Interface services.

2. Common User access

This portion of SAA expresses the conventions and protocol for the interaction between the user and the computer program/system. These are the rules and conventions that deal with the user's comfort, understanding and intuitive feel for how the application system is responding to the user's interaction.

The elements involved in the user access definitions deal with screen appearance, unified mechanisms to traverse the application system, standard keyboard conventions, user selection ~~action~~ criteria, help invokation, terminology and messages, to name a few.

Once applications adhere to the Common User Access conventions the amount of time to learn new application will become minimal in terms of the external interfacing. This will have a significant impact on the training costs of the individual users as well as the ability to train a broader range of potential users.

As more users become comfortable with how an application behaves there should be reasonably more acceptance to using computer

in general and no concern as to what specific system the user is actually deriving computer horsepower from.

a) BASIC elements

In exhibit III-7 the basic elements of the common user access are depicted. These elements describe the general interface characteristics between the user and computer

i) Machine to user

This basic element describes conventions and rules for what the computer system/application delivers to the user in terms of what the user sees. This deals with how data or information is presented or laid out to provide the maximum comfort to the user. Examples of items in this part of the user interface deal with spacing, formatting, number of lines per screen, graphical conventions to name a few.

ii) user to machine

This basic element concerns itself with how the user recognises the information or data in i) above and is afforded the opportunity to respond. Some of the actions are how to respond from a keyboard perspective, how to move a mouse or navigate with cursor keys or how to respond to

cc

Exhibit III ->

SAA Common User Access - BASIC Elements

- MAchine → USER
- USER → MAchine
- USER Awareness

multiple choice, yes/no or default considerations.

(iii) User awareness

This basic element describes the intuitive nature of the machine to user and user to machine environments to allow the interaction to be logical, predictable and straightforward. User awareness is concerned with the minimizing of surprises and the general overall comfort level of the application and the system and the traversing of all applications and all systems.

These general concepts are a key element of how successful SAA will be in meeting its stated goals. It should be noted that the user access considerations are integrally a part of the Common Programming Interface discussed earlier.

b) INTERFACE DIMENSIONS

In order to attain these ambitious interface goals there are three interface dimensions that need be considered. These are stated in Exhibit III-E as "interface dimensions."

c) Physical Consistency

This interface dimension deals with how the hardware is consistently used to the convenience and comfort of the user. Factors such as function keys being placed in the same location ~~and to~~ on similar or like devices

Exhibit III-8

SAA Common User Access - Interface Dimensions

- Physical consistency
- Syntactical consistency
- Semantical consistency.

across all hardware systems deals with physical consistency. Users of PC XT, AT and PS/2 systems are aware of different keyboards and the inconvenience they represented. Thus once the user learns some physical convention or mechanism the same characteristic will exist on all subsequent hardware supporting similar functionality.

ii) Syntactical consistency

This interface dimension involves the flow of user interaction in invoking functionality. Examples are in presenting screen panels the system defaults are filled in and those that are most likely to be modified presented first rather than having to traverse defaults that are unlikely to change.

iii) Semantical consistency involves the meaning of elements or keywords that are used in the user interface. An example would be the word EXIT leaves a program module with the ability to reenter whereas QUIT means to leave without the ability to REenter. While the difference may seem subtle the command meaning is consistent among all applications and within all systems.

Chapter III - Continued

3. Common Communications Support

a. Overview

A major factor in the completeness of SAA is the support for communications capabilities that ~~allow~~ provides platform interaction for applications, networks and specific devices. Fortunately IBM has been in the process of developing a communications architecture well-known as Systems Network Architecture (SNA). SNA was announced in April of 1974 as the means to allow terminal to mainframe communication and provide networking.

Since 1974 IBM has been evolving SNA to meet the needs of the market. The original SNA functional description which was the ~~of~~ subject of a complete issue of the IBM Systems Journal of April, 1974 ~~he~~ detailed a relationship of device to platform of slave to master i.e. the centralized processor was totally in control of the communication process.

This has since changed to reflect the distributed processing evolution that has occured and new functionality such as LU6.2 and PU2.1 have been announced and implemented. In addition, IBM has shown its intention to embrace International Standards Organization's OSI communica

interface and X.25. after much foot dragging and reluctance.

Several distinct elements embody Communications Support namely: data streams, application services, session services, ~~dlc~~ ~~robot~~ network and data link controls. These are very similar to the elements of the original SNA architecture as shown in exhibit III-9. The similarities are best described as follows (although it is not a strict relationship):

Please list as shown on back

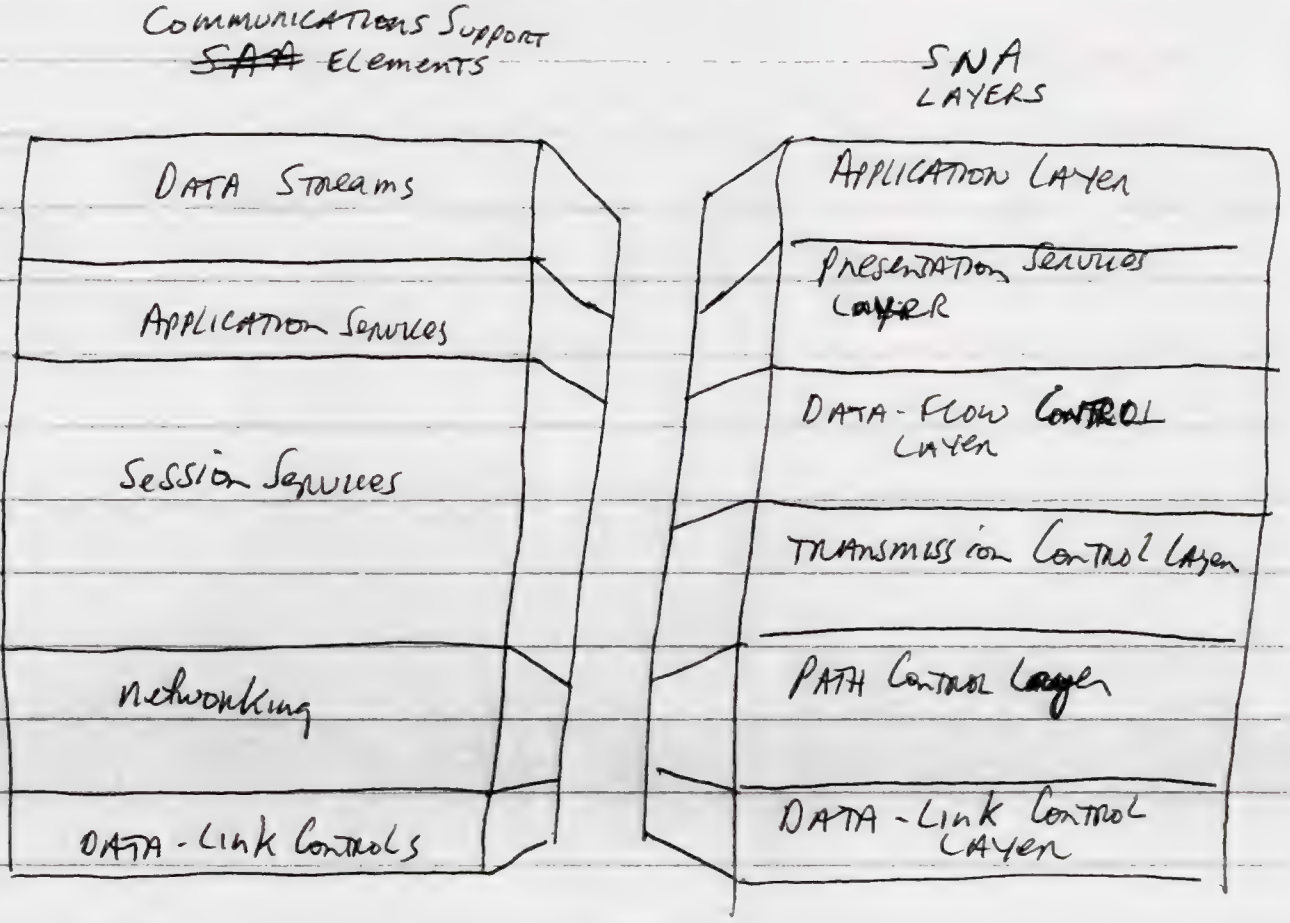
- SAA's Data Streams and Application Services are reworked versions of SNA's application layer
- SAA's session services ~~approximately~~ approximately matches the capabilities of SNA's transmission ~~services~~ Control Layer, Data-Flow Control Layer and Presentation Services Layer inclusive. The goal of both of these described facilities (or sets) is to arbitrate interactions between different platforms
- SAA's Data-Link Controls generally map to the SNA Data-Link Control Layer
- SAA's Networking elements generally match the ~~flow~~ facilities provided by SNA's Path Control Layer.

~~How~~ While the general conclusion is that the SAA Common Communications Support is reasonably similar to SNA it still is important ~~to~~ to describe the individual

Exhibit III-9

SAA Common Communications Support

Similarities to SNA



elements, afterall SAA is more than SNA due to the other three Common interfaces.

Exhibit III-10 shows the sub-elements of the DATA Streams element.

b) DATA Streams

i) 3270 DATA Stream

This element of Common Communications Support (CCS) deals with how data and commands and control information are handled and and formatted for IBM displays and printers. Since the 3270 display terminal units are so prevalent it is key that this support be included. It should be noted that real 3270 devices are likely to give way to varieties based on IBM PS/2 hardware providing for additional basis for the merit of SAA i.e. standardizing the user interface.

ii) Document Content Architecture is the specification for the form and structure of text documents. This is an important element for office environment applications and deals with the how documents are able to be optimized for eventual manipulation and revision.

iii) Intelligent Printer Data Stream defines the data and control information to support high performance high functionality page printers and typesetters. Page printers are the IBM 4250, the 3812 and 3800 which IBM calls all-points-addressable devices. ~~The~~ IPDS deals with how text and image data along with font information

are combined and supported to these output devices.

c) Application Services

The sub-elements of Application Services are depicted in Exhibit III-11

i) SNA Distribution Services (SNADS)

SNADS functionality involves the distribution of documents, files and information throughout the (an IBM) network. It is able to support multiple users and applications through the use of routing and store and forward services. In addition it provides an asynchronous distribution facility causing the need for active sessions between the communicating parties to no longer be required. SNADS is a key facility in supporting process to process communications and builds upon the Application Program to Program Communications (APPC).

ii) Document Interchange Architecture (DIA)

DIA is the definition of protocols defining common office functions performed co-operatively by IBM program or product. Examples of these functions are: the sending and receiving and filing of documents, using library services and methods. DIA therefore facilitates the interchange of documents among devices and device types.

iii) SNA Network Management Architecture

This sub-element provides the IBM methods and techniques

Exhibit III-10

Common

SAA / Communications Support

DATA STREAMS

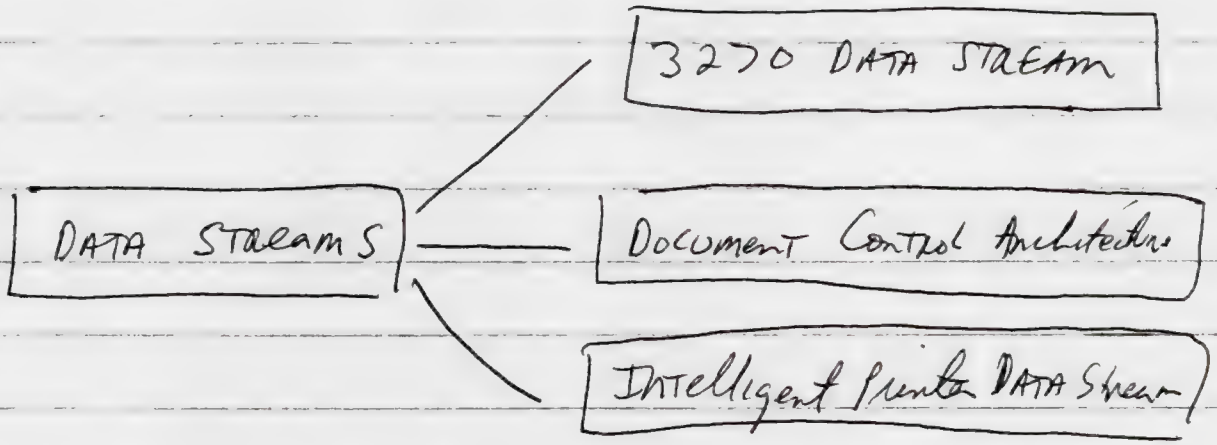


Exhibit III-11

SAA Common Communication Support
Application Services

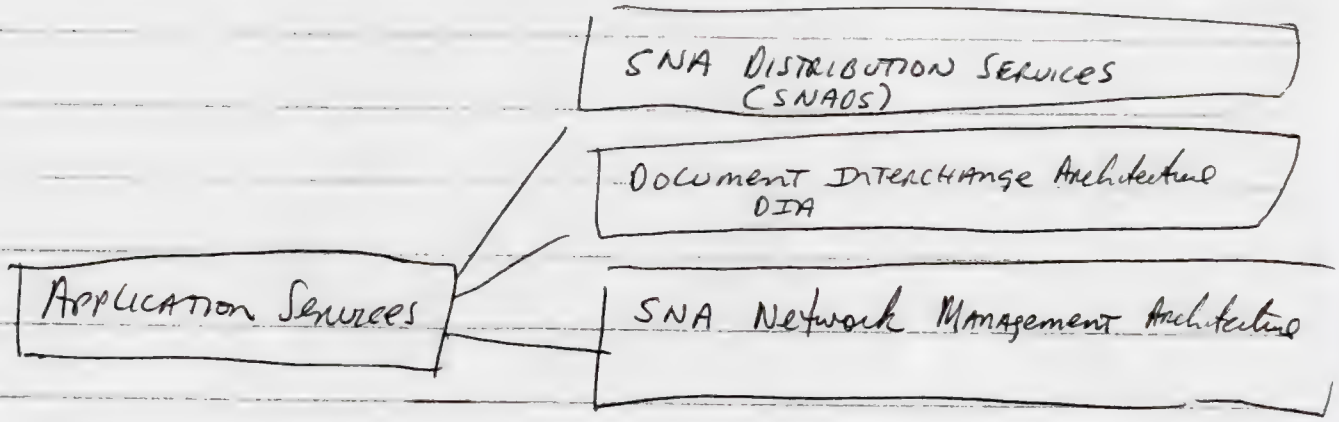


Exhibit III-12

SAA Common Communications Support
Session Services

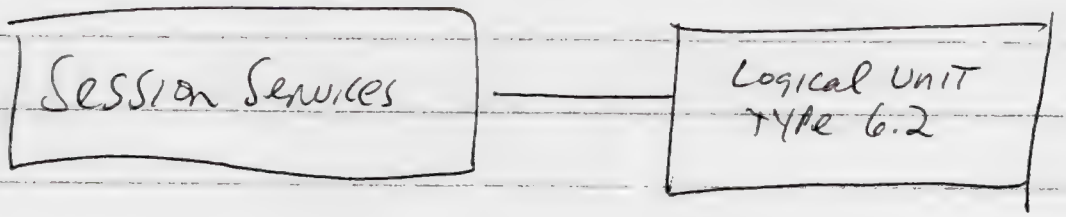


Exhibit III-13

SNA Common Communications Support Networking

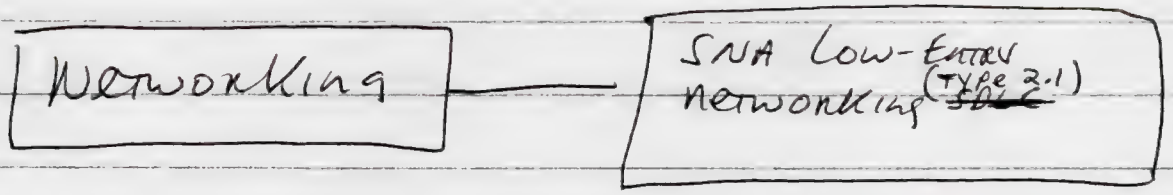
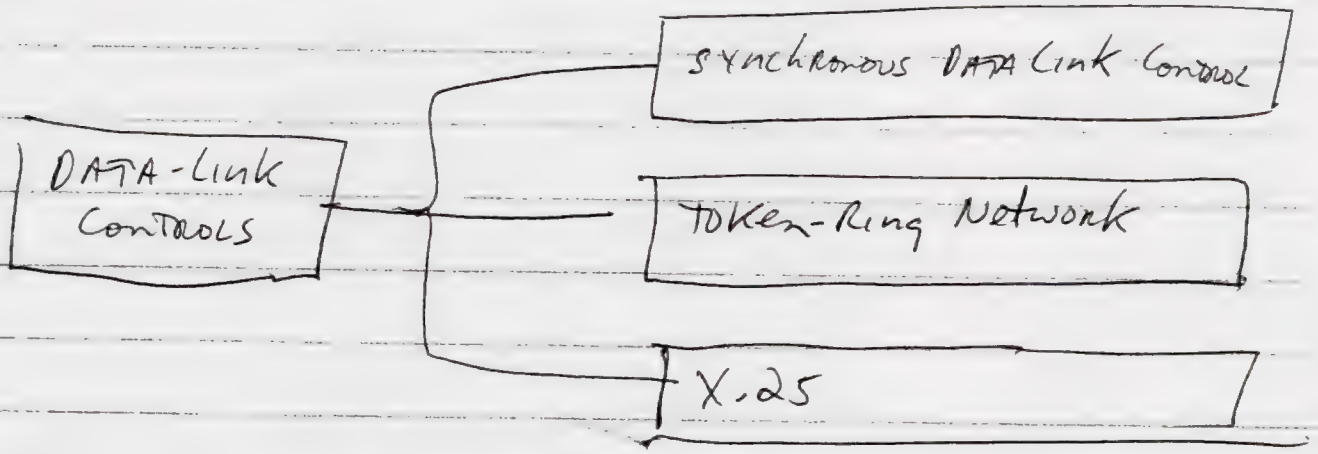


Exhibit III - 14

SAA Common Communication Support.

DATA-Link Controls



for the management of communication networks These SAA ~~ab~~ elements play a key part in helping IBM's customers to understand, manage and configure their networks in a logical and consistent fashion. Thus the SNA SMA ~~audit~~ supports problem management, change management, configuration, operation and performance characteristics necessary to manage complex network environments

d) Session Services

i) Logical Unit Type 6.2

Session Services are provided by Logical Unit (LU) 6.2 which describes program to program communication protocols. These facilities allow outlying devices, and computers to communicate on a peer to peer basis as opposed to a master-slave basis of the ~~cache~~ original SNA definitions. LU6.2 is IBM's answer to providing distributed processing of dispersed applications. Session Services facilities and services ensure compatibility of communications functions across the network.

e) Networking

i) Low-Entry Networking Nodes

SNA Low-Entry Networking (LEN) a more commonly called TYPE 2.1 nodes, support peer-to-peer communications functionality. LEN provides for programmable or fixed function system nodes.

LEN provides for multiple and parallel communication sessions to be established between nodes that are directly connected to each other. LEN is able to support a variety of protocols including Token-Ring, X.25, and SDLC both switched and non-switched.

F) Data-Link Controls

Exhibit III-14 lists the Data-Link Controls

i) Synchronous DATA LINK CONTROL

Synchronous Data Link Control (SDLC) is a well-defined discipline for managing a serial-by-bit information transfer between nodes within a communication link. It includes comprehensive error-checking and detection and recovery procedures for link transmission errors. SDLC was a major improvement over the previous bi-synchronous communications in the 1974 SNA announcements and also conforms to an operational subset of ISO's HDLC.

ii) TOKEN-Ring Network

IBM TOKEN-Ring Network consists of a wiring system, an access protocol and a set of communications adaptors. Transmission is accomplished via a "token" that passes through the ring providing attention to the node controlling the ring. Token-Ring Network is used to communicate ~~and~~ between devices within an environment. Token-Ring protocols are based on IEEE 802.2

and 802.5 standards.

(iii) X.25

X.25 is a packet-oriented interface for attaching host computers, communication controllers and terminals to packet-switched data-oriented networks. The support of X.25 is more than a data link protocol as defined in the OSI Reference Model.

4.) Common Applications Support

a) Overview

It is clear that Common Applications Support is the resultant of the adding together of the three other Common Interfacing elements in SAA. Historically IBM has not been known for developing applications for industry-specific or cross-industry functions. As part of the SAA announcement IBM indicated that it would be taking on more responsibility in this important area.

The IBM Corporation has taken some 3rd party applications such as Lockheed's CADAM, Hogan's banking software and sold them into the market. As part of SAA IBM will be making a more proactive stance in this fast growing opportunity area. ~~The first example of an IBM developed SAA applica~~

c) ~~IBM's~~ Initial ~~SAA~~ Application

The first application to be developed by IBM using SAA conventions is to satisfy the needs of the office automation market. This application being cross-industry in focus is an attempt by IBM to sort through the plethora of existing office automation products to offer a single comprehensive system to meet the needs of its customers in the three major computing platforms.

Input believes this first application is a wise choice and is being precipitated by the popularity and success of Digital Equipment's ALL-IN-ONE applications capability.

Having one consistent office automation view will allow IBM to solve the needs of electronic mail, calendaring, decision support, word processing and document processing. The more popular features are being drawn from PROFS (Professional Office System), DIOSS (Distributed Office Systems Support, AS(Applications System) and DisplayWrite/370. The code name for the project is OFFICE 90 and based on the complexity of the undertaking will probably not be available until close to 1990.

(ii) Applications Systems Division

IBM formed the Application Systems Division in July of 1987 to provide focus and direction for the development and acquisition of applications across its entire product line. There are two basic mandates:

- Consolidate applications software development from the previously disparate efforts
- Manage the corporate-wide implementation of Systems Application Architecture

The overall goal is to increase the inventory of applications software be it from internal developments or third parties. This effort should result in more meaningful applications and assist IBM in substantiating the Solutions for Us marketing concept. When initially formed the ASD was headed by Joseph Guglielmi (president of the division) reporting to Ed Lucente, VP and Information Systems Group executive.

Based in Milford, Conn ASD's activities are spread over 11 laboratories worldwide housing more than 6000 people. Exhibit III-15 shows the original structure of the ASD and the major areas of responsibility of the key groups in ASD. It should be noted that SAA and ASD have received even higher importance and status within IBM by the formation

Exhibit III-15
ASD ORGANIZATION AND REPORTING LINES

TERRY LAUTENBACH
SENIOR V.P. / PRESIDENT U.S. OPERATIONS

ED LUCENTE
GROUP EXECUTIVE: U.S. MARKETING and SERVICES

NED LAUTENBACH
APPLICATION SOLUTIONS

JOSEPH M. GUGLIELMI
PRESIDENT
~~APPLICATION~~ APPLICATION SYSTEMS DIVISION

Vice Presidents

BOB BERLAND	BOB WILLIAMS	LORRAINE FENTON	MIKE SARANGA	TONY MONDELL
VENDOR & Development operations	COMPUTER INTEGRATED MANUFACTURING	FINANCIAL and GENERAL SYSTEMS	APPLICATION DEVELOPMENT SYSTEMS	OFFICE SYSTEM
• VENDOR SUPPORT • operations • planning	• Engineering Design • PLANT OPERATIONS • Integrated manufacturing systems	• Lines of business emphasis: - Banking - MEDICAL - etc...	• Assist 3RD PARTY SOFTWARE VENDORS WITH SAA	• OFFICE functio and packaging

7 two additional lines of business operations called Application Solutions and Programming Systems under Ned Lautenbach and EARL Wheeler respectively. ~~Based on~~ The major sweeping reorganization that IBM ~~announced~~ announced in January, 1988 ~~called~~ described six U.S. divisions under Terry Lautenbach:

~~IBM~~ PERSONAL SYSTEMS

~~IBM~~ APPLICATION BUSINESS SYSTEMS

~~IBM~~ ENTERPRISE SYSTEMS

~~IBM~~ TECHNOLOGY SYSTEMS

~~IBM~~ COMMUNICATION SYSTEMS

~~IBM~~ U.S. MARKETING and SERVICES GROUP

~~It should be~~

Earl Wheeler as head of the new Programming Systems reports to Terry Lautenbach while Ned Lautenbach (Terry's brother) reports to ED Lucente, head of U.S. MARKETING and SERVICES. ~~Thus IBM~~ BASED on how the new organization was structured in January, Ned Lautenbach should have reported to his brother Terry. This clearly would have represented some difficulties to say the least but does bring forth two ~~interesting~~ thoughts

- Application Solutions will not truly get the line of business perspective as it reports still within another line of business
- IBM does provide the best people available

to manage its important business units and will not let reporting structure stand in its way

5. SAA TIMETABLES

A study on SAA is not complete without some forecast as to when it will be available. IBM is not announcing ~~any specific~~ time tables (as one would expect based on its previous behavior).

In order to present SAA timetables DRDOT has developed a view based on major platform groupings i.e a hardware/operating systems view and another view based on SAA applications availability. The first view speaks to when is it physically possible to develop an application on particular platform groupings. The second view presents the notion of when are end-user applications available that make SAA worth the wait (so to speak)

a) Hardware/operating systems

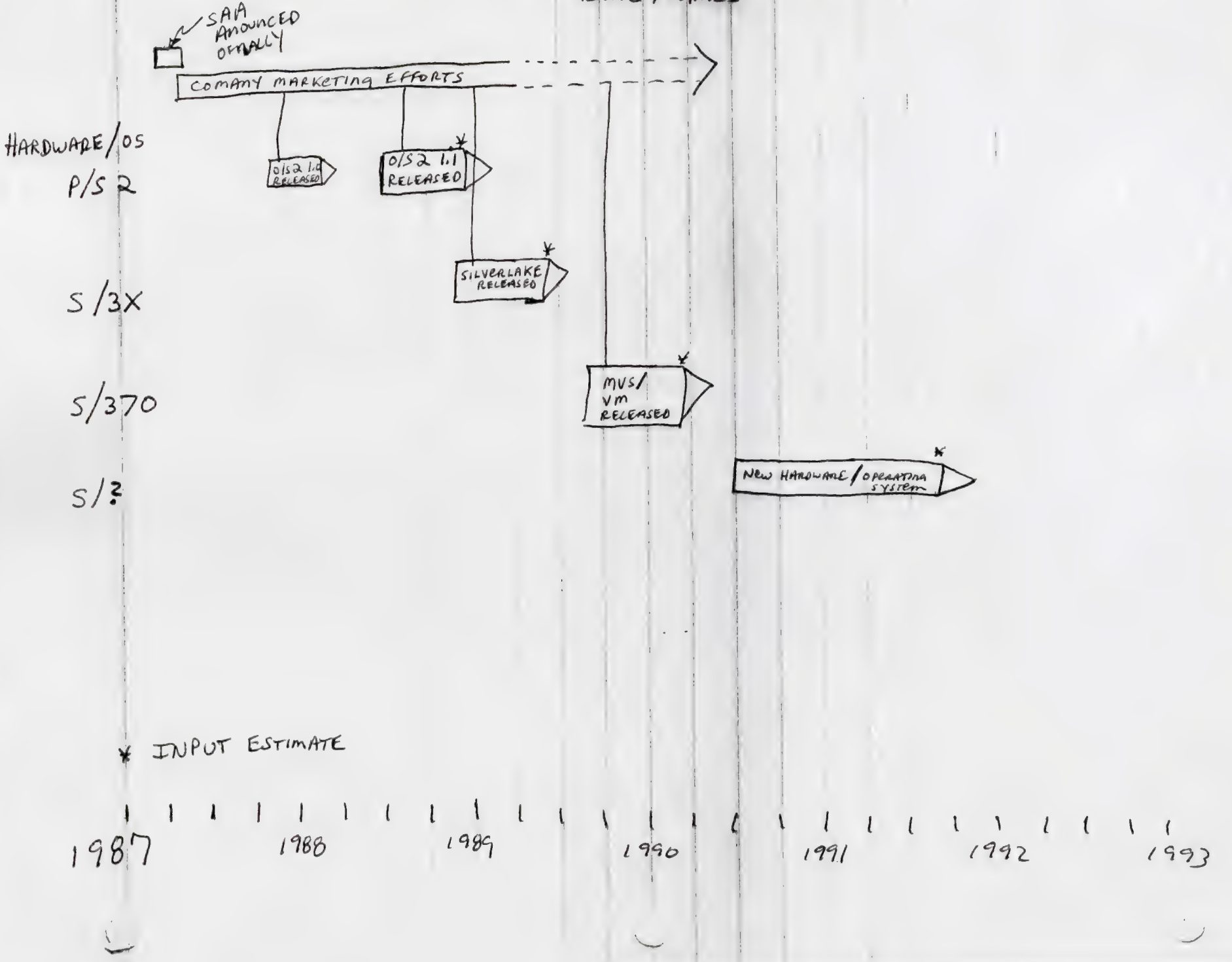
The hardware/operating systems IBM describes in its SAA product literature falls into 3 main classifications micro, mid-range and mainframe embracing 4 operating systems MVS and VM on the mainframes, OS/2 on the micros and an ~~indeterminate unnamed operating~~ not yet named O/S for the mid ranged called AS400 (which has not been formally released) for the well-known "SILVERLAKE". SILVERLAKE is to be

announced late 2nd Quarte 1988 and is IBM's answe to what is needed in the mid-range. [It should noted that RPG the most common programming language on the S/3X product familes has not bee announced as part of SAA].

Exhibit III-16 shows the DATAPRO estimate on the hardware platforms and requisite operating systems. The convention used in this exhibit is the flat side of the bullet is the actual time the operating system ships. The front part of the bullet signifies that enhancements will be made as the operating system takes hold. Note the last line of the exhibit is called "S/2" and this signifies the DATAPRO belief that a whole new hardware architecture/product family will be available in the early 1990s.

A fitting name would be "490" (like for the 90s) however another computer manufacture might take exception to this name. The underlying premise which should actually be very exciting for IBM's users is the concept that what ever the hardware/operating system that comes along in the 1990s ~~that for the first time~~ a major conversion will not be required for SAA users. This mean SAA applications will execute easily in the follow-on hardware of IBM. This

SAA HARDWARE / OPERATING SYSTEM TIME FRAMES



is a major user win for SAA.

B) Application Systems

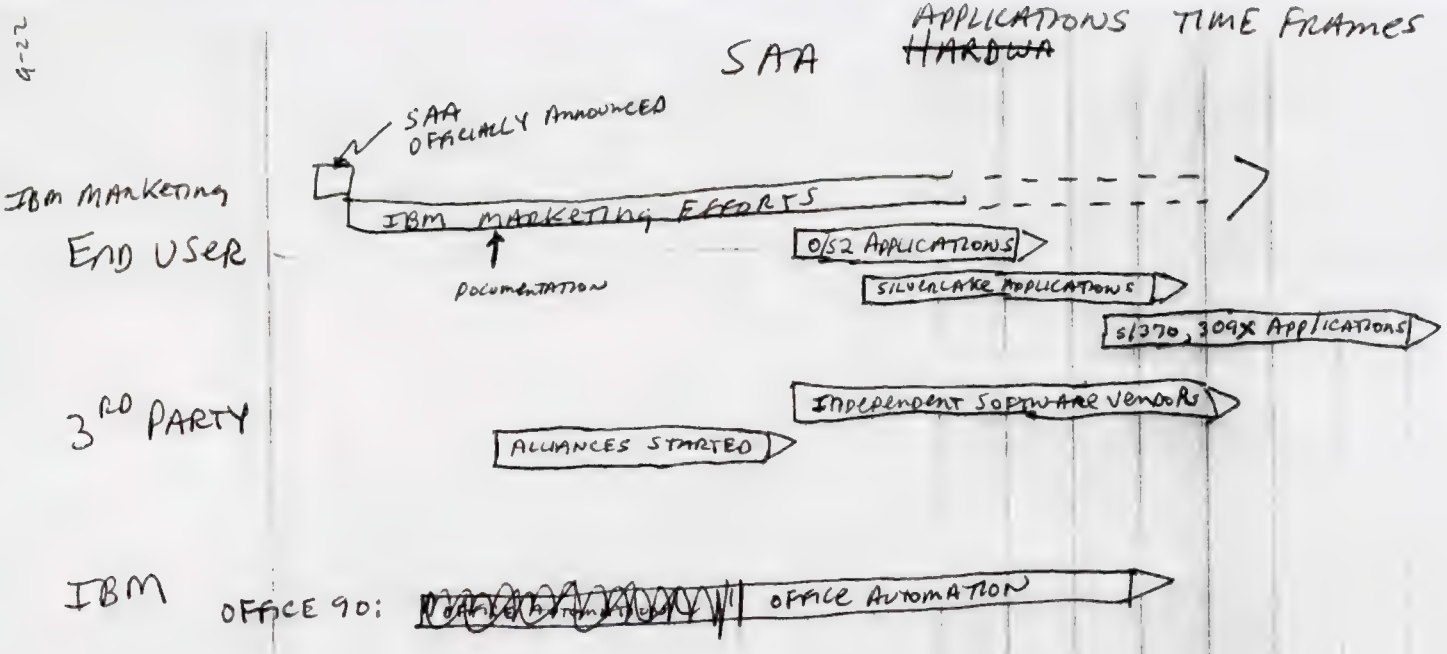
The value of SAA is in the number of applications that are developed using SAA conventions. After all what ~~go~~ value is an application architecture or environment if it isn't ~~got~~ used? Exhibit III-17 is DATA's estimate of the applications available in SAA from an end user, 3rd party and IBM perspective. This is shown using the same convention as Exhibit III-16 i.e. the flat side of the bullet is the time the actual start of the event occurs. ~~also~~

also shown on the chart is the start of SAA, documentation availability and continued marketing efforts. IBM marketing personnel have been making an effort of incredible proportions to reach the ~~independent~~ ~~parts~~ software vendors to explain the merits of SAA. Furthermore these individuals have been visiting the F500 companies, conferences and the press to also explain the benefits of SAA.

It should be obvious that all independent software vendors ~~will~~ that currently offer products on IBM hardware will opt for stating that they also will support SAA. after all SAA is a major effort on the part of IBM that noone knows for sure how successful it will be. Since

4-22

SAA APPLICATIONS TIME FRAMES



PLS note: the shapes are to be bullets if there is some artistic way to do that.
Thanx

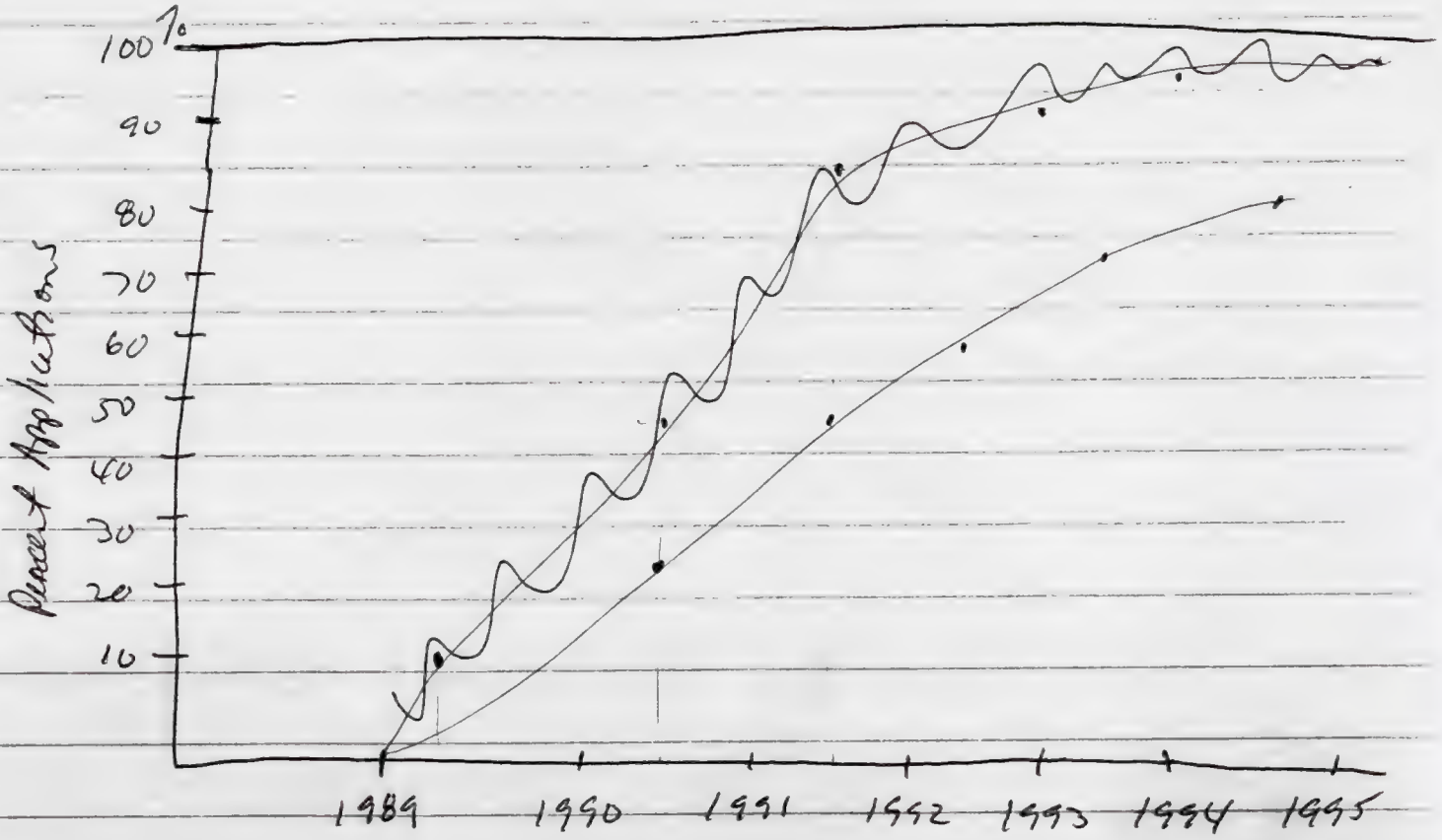
1987 1988 1989 1990 1991 1992 1993

there is every reason to be believe it will be successful. There is absolutely no reason why a software vendor would not say it intends to be SAA compliant. In fact many software vendors have internally developed a similar concept for their software to facilitate the software vendors desire to port ~~the~~ his software to another ~~environment~~ environment. An example of this is the relational data base companies especially relational technology who is going around with buttons saying "SAA TODAY."

Input estimates that by 1993 almost 90% of the application programs available for the IBM hardware environment will say they are SAA-compliant. A graph of the SAA applications available as a percent of applications is shown in Exhibit III-18. At this time the user expenditures will be approximately $7 billion for those applications offering SAA capability. Exhibit III-19 shows the growth of user expenditures for SAA applications. It should be mentioned that applications will be SAA-compliant whether the user desires them to be or not.

Exhibit III-18

SAA - ~~Percent~~ Applications Available (Percent)

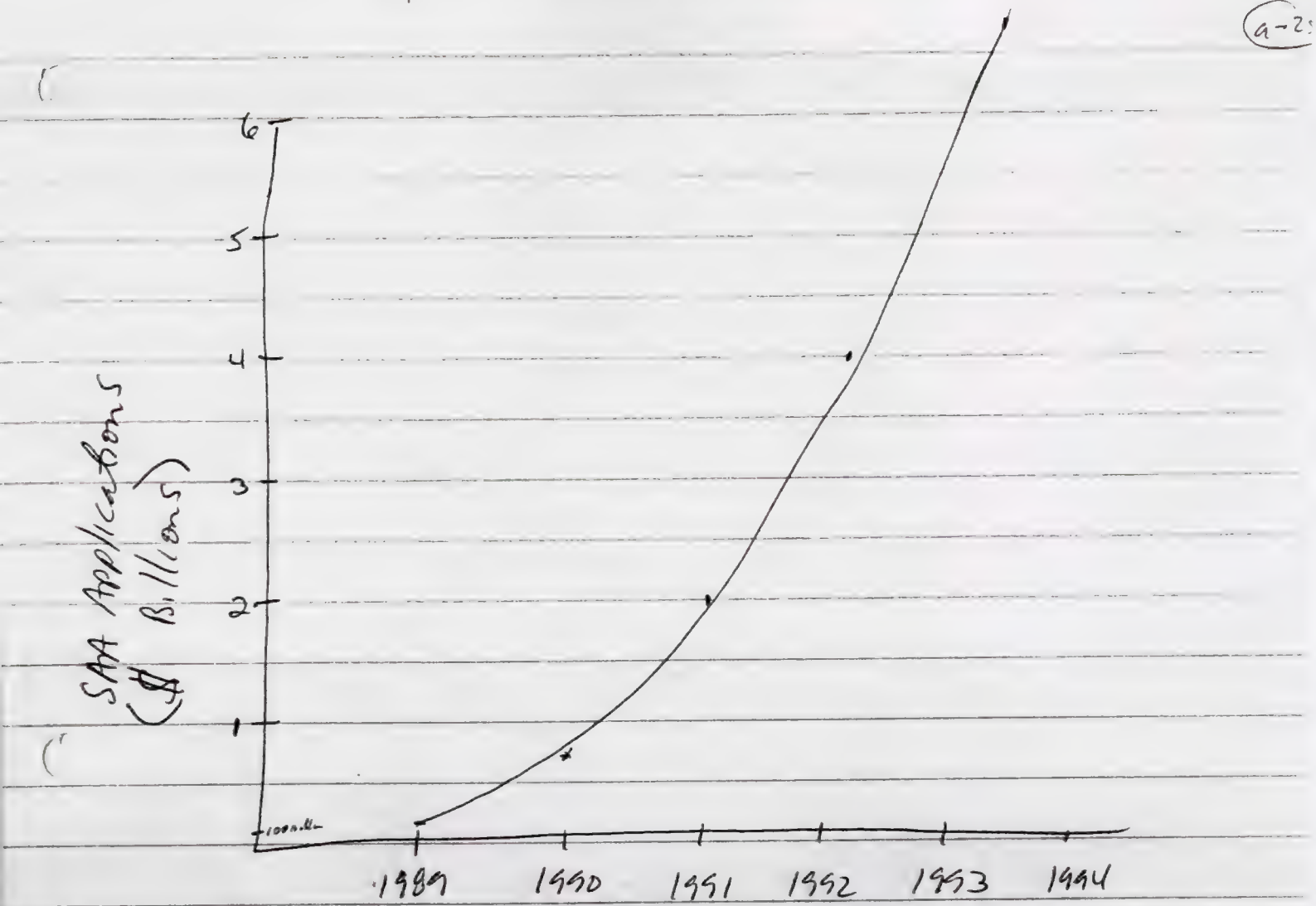


Use these points	1989 1/2	10 %
	1990 1/2	25 %
	1991 1/2	45 %
	1992 1/2	55 %
	1993 1/2	70 %
	1994 1/2	80 %

Exhibit III-19
SAA - Applications Revenue

★ 18. Billion

(a-2



points	1989	.100 Billion
	90	.500 Billion
	91	2.000 Billion
	92	4.000 Billion
	93	7.000 Billion
	94	18.000

IV ISSUES, TRENDS and DIRECTIONS

This section will discuss the market factors surrounding SAA and attempt to provide insight into this significant event and directional statement that IBM has dropped on the market. Exhibit IV-1 summarizes the major issues.

A) SAA - is it marketing hype?

- SAA is a major "comprehensive system. However the reality is that if one considers the formal announcement as 3/17/87 (ST. PATRICK's DAY) [note: there were leaks to the press as early as November, 1986] that at the reports writing there still is no significant or viable example of SAA.

The SAA promise and IBM corporate commitment was the resolution of the architectural differences (from the user's viewpoint) amongst the myriad of hardware products being offered by IBM.

The ambitious goals and major consistency effort on the part of the corporation sent a rush of concern and anxiety to the end user community, the software development community and IBM's competitors. Users need to know what SAA means to them in terms of current systems and future systems so they can take advantage of SAA and make sure their software development activities are compliant. Developers desperately need to understand SAA so they can build software to the SAA conventions so that

Exhibit IV-1

SAA
MAJOR ISSUES

- MARKETING HYPE?
- SOFTWARE FOCUS
- HARDWARE INDEPENDENCE
- OPEN APPLICATIONS ENVIRONMENT
- CLOSED HARDWARE ENVIRONMENT

compatible applications.
Competitors must track SAA and its developments to ascertain how to compare their overall migration strategies and system compatibilities.

At this writing based on what has been delivered one can argue that SAA is still mostly vacuous. The concept of architectural consistency is a very appealing and soothing concept, one that hardly anyone can contest does not make sense. A major observation input would offer is that SAA is more a repackaging of existing capabilities than a major development and approach that was conceived in the IBM development labs.

B) Software Focus

- IBM is more focused on software.

no ¶ There is no doubt that IBM has enjoyed considerably more success in its software products and services business than in its hardware systems business. This pretends an ominous sign as IBM's software product success is in large measure accounted for by its ~~sales~~ marketing of systems software products as opposed to applications software.

As hardware, continually becomes ~~to~~ less expensive and software becomes a more significant portion of the total system it would only be natural to shift in the direction of where the longe range revenue and profit gains can be achieved. Add to this the current tendency to obtain distributed processing functionality witness the success of the mid-range/department computer systems i.e. DEC's VAX line, Sun's workstations and the newer IBM PS/2 (high end). Application software is where the computer industry is leading.

c) HARDWARE INDEPENDENCE
SAA is a double-edged sword.

no ¶ IBM over the longer term can then make major changes in hardware technology without impacting the application investment of its user community. The large scale computer users will no longer accept the expense and chaos that IBM has asked them to incur when new hardware/operating systems are brought to the market. All of IBM's competitors have long solved that problem and provide minimal conversion efforts to upgrade across their systems families.

D) Open Applications Environment

SAA ~~and its~~ has a natural outcome of fostering an open environment with the IBM hardware lines. This should benefit IBM's user community immensely as there is likely to be more software available.

The ability to develop and execute application software in all IBM hardware platforms should foster several interesting developments.

First, there will be more intense competition as independent vendors will no longer have to choose ~~a~~ hardware platform to develop application systems for and will not have to be as expert in the hardware/operating system.

Second, IBM itself has announced intentions to offer applications systems ~~which ordinarily~~ through its sales and marketing force. Some applications will be developed internally others contracted for such as the Hogan Systems deal of 1987 for banking software or the Transform Logic relationship in 1988. While IBM has the largest dedicated marketing force that in itself is not a guarantee of success witness the ~~the~~ Hogan software success

(lack of)

Third, there will be some pressure on keeping prices down as vendors position themselves into functionality niches and competitive pressures force weaker vendors

to either maintain market share or attempt to buy market share.

~~And finally~~

In addition users are likely to benefit due to the application vendor's need to provide enhanced functionality to more closely model the application as a means of differentiation of the vendor's product. Thus product functionality should be more closely in tune with the user's requirement.

These are the main ~~fact~~ benefits of the Open applications architecture that SAA represents.

E) see next page

E) CLOSED HARDWARE Environment

- SAA only supports IBM hardware.

The current major application needs of large systems users is to be able to accommodate heterogeneous hardware platforms. SAA clearly does little to acknowledge the possibility of user's running a non-homogeneous vendor environment. A number of users have worked at accomplishing application systems that use several vendors hardware.

A number of independent vendors are having limited but increasing success in offering application tools that transcend multi-vendor environments. Examples of vendors offering these capabilities are ORACLE, Relational Technology, Informix, SYBASE. There also are several vendors offering connectivity tools such as Network Innovations (recently acquired by Apple), Communication Solutions and System Strategies.

All of the above vendors allow for cooperative processing applications and the ability to have diverse computing environments interact in an effluent fashion. The IBM SAA solution does not provide for interacting with other vendors computing environments. However the fact that IBM itself is unlikely to participate in a multi-vendor application solution does not mean that other

vendors are precluded from such a strategy. Because as previously mentioned in chapter III the SAA environments do provide for cooperative processing through APPC and LEN functionality. thereby limiting heterogeneous processing to be accomplished. An aggressive hardware vendor (other than IBM) or software vendor could obtain significant market share by such a creative strategy.

F) IS Issues

The IS departments of large IBM customers will have to study the SAA announcements to determine what longer term directions and commitments are logical by embracing SAA. One does not go out and buy SAA per se but rather factors it into a long term IS plan and budget scenario

1) User benefits

SAA offers the longer term perspective of training users and not losing the investment due to the consistent user interfaces and conventions that SAA provides for its "users". This makes upgrades or product changing less difficult and less expensive

In addition, as mentioned previously, SAA should increase the choice of applications made

available to the user community

SAA will allow users to choose the hardware that best suits their current computer resources needs and not have to make decisions to buy more hardware than necessary. This users will be able to manage their budgets more effectively and not be concerned about the software investments they made as these investments are now essentially guaranteed

2) IS Manager - Point of View

The IS Manager is a very key element in developing F1000 awareness of and acceptance of the SAA strategy. The IS Manager in an organization has a strong influence over the plans and buying decisions of the departmental systems that have been permeating the corporate divisions of large enterprises. In addition the IS Manager has a principal architectural responsibility regarding the corporate plan.

The SAA announcements of IBM provide the IS manager with fuel for a strong strategy improvement that provide the enterprise with a cogent basis for including IBM systems for the departmental system needs of the enterprise. IBM announces of this significance and magnitude have

historically received much attention and action based on intent and future. Most industry participants respect IBM's resources and sense of commitment for IBM does tend to deliver on most of its promises.

Exhibit II-2 shows a brief check list the IS Manager should use to calibrate SAA for the enterprise. Input suggest this check list as a convenient way to manage and understand the SAA opportunity.

a) Perform inventory

To effectively appreciate SAA the IS Manager must perform an applications inventory of those applications developed or purchased in the past, present and future. Items to review are those applications developed in-house, those packages purchased, those under development. The IS Manager needs to look at the data base systems being used, file types used, security features, communication links and future equipment plans. It is key to the SAA assessment to know your application inventory.

b) Develop SAA expertise

Part of understanding SAA is making sure the organization has the necessary knowledge and expertise to understand what SAA is and where it is going. SAA is not totally cast

Exhibit IV-2

SAA - IS MANAGER PLAN OF ACTION

- Perform APPLICATION INVENTORY
- Develop SAA EXPERTISE
- Discuss Vendor Actions
- Determine Business Needs
- Follow technology issues
- Focus on Strategic needs

in concrete and there is a constant flow of documentation. This individual would also attempt to influence IBM (to the extent that is possible) to provide additional functionality based on the aforementioned application inventory.

c) Vendor Discussions

Beside having open and frequent discussions with IBM the IS Manager and ~~the~~ the SAA "expert" must have similar discussions with these vendors that have been identified to be part of the future applications requirements. To determine how SAA fits into the future needs of the organization the IS Manager must know how other vendors intend to "play" in the SAA environment. Discussions with ~~these~~ independent software vendors will unlikely provide additional insights into where others see SAA evolving.

d) Business needs

In assessing the needs of the organization it is important to keep in mind the business needs of the organization. These business needs should satisfy the tactical requirements of IS and be consistent with computing requirements and business objectives of the organization. In this category one needs to contemplate how other vendors can meet or impact the business needs of the organization and how other vendors (both hardware and software) can interact w.

a possible SAA plan.

e) Technology monitoring

While reviewing a possible SAA plan to meet the business and ~~strategic~~ needs of the organization it is imperative to keep an open eye and mind to new technologies on the horizon. While it is clear that by sheer size and magnitude IBM has most of what any organization could need it is not always with the best price/performance available in the market.

In addition some companies have carved out special niches around application solutions that have had better functionality and fit in meeting the user's requirements. When it comes to applications IBM itself has not been as integrated with solutions. SAA and ASD are intended to reverse that image. Solution Packs, under the responsibility of ASD have been slow in making any application penetration. There is no doubt in INPUT's mind that IBM will finally realize success with the Solution Pak's concept.

F) Strategic Focus

The final major SAA ASSESSMENT criteria is the long-range goals and directions and how the computing environment plays in to the ~~strategy~~ of the enterprise. The IS Manager or CIO individual's strength in the enterprise is in providing insight and direction to the

critical needs of the enterprise from an information systems perspective. SAA may be consistent in mapping the long-range objectives of the enterprise. IBM has made a significant effort to have SAA be capable of being flexible in satisfying distributed needs, centralized needs, language, communications in an orderly and cogent fashion.

The six criteria presented above should prove useful in assessing SAA for most enterprises. Something as key as SAA from IBM must be given serious consideration.

G) IBM IMPACTS

1) Benefits

The adoption of SAA as a major business strategy of IBM produces several important benefits. As most major announcements it introduces the well-known FUD (Fear, Uncertainty and Doubt) factor which generally has a negative effect on IBM competition. While this slowdown in user demand for competitive product IBM generally buys time to make the originally announced program a reality.

There are in SAA some additional non-tangible benefits that IBM itself accrues from the

introduction of SAA. And this goes back to the original basis behind why SAA happened.

Prior to SAA IBM had disparate hardware and software for a number of product lines that were essentially developed without a major long-range plan. Thus each product had its division R+D that were trying for resources to execute their divisions business plans. Each product had its own language versions, its own documentation its own product marketing etc.

With the advent of SAA each division (now Line of Business) has a mandatory commitment to comply with SAA. This means there is consistency and less redundancy of documentation, product marketing etc. While SAA may be long in coming its arrival will have some additional external benefits to IBM that should result in more efficiency for IBM's customers.

2) Risks

With any major announcement and strategy there are benefits and risks. The major risk that Input Forces is that IBM's competition can more easily connect into the SAA environment provide a subtle bridge to their environment. In addition vendors will be able to port their

systems to IBM hardware to make bridges to their environments more natural and transparent.

Another risk is that of independent software vendors no longer needing to pick a hardware environment in which to develop their applications. For as Ingrid has indicated on numerous occasions in this report by adhering to SAA guidelines there is the advantage of being environment independent. Thus the competitive doors are open under ~~which~~ which is likely to have an impact on IBM's revenues and profitability. For as competition increases the weaker vendors will be willing to sell at lower margins thereby undercutting everyone ~~else~~ else's profitability.

A third significant risk is that IBM does not provide enough support for certain applications or systems. This risk has always been around and is only slightly heightened by SAA. The fundamental point is that IBM is a box oriented company and for it to truly succeed with SAA and AD it must change its ~~market~~ marketing philosophy and strategy. SAA is a start in that direction.

H) SAA Shortfalls

In spite of its comprehensive nature, SAA does have some obvious shortfalls which will be discussed at this time.

1) NOT TOTALLY SPECIFIED

SAA, in all its majesty, does not completely specify everything everyone would like to know. This is viewed as a double-edged sword in that it allows IBM to have flexibility and to include new concepts and needs. The other edge, however, is SAA then looks like a bandaid approach and lacks a sense of certainty.

There is no doubt that SAA will evolve and grow, much like SNA did, to reflect new technologies and user needs. An SNA example of change and growth is the IBM addition of APPC to SNA. There have been numerous industry consultants indicating that SAA is not a complete architecture and seems to lack the same academic characteristics that SNA possessed when it was introduced in 1974.

2) Not all OS covered

It is noteworthy that several operating systems are not covered in the initial documentation available for SAA. Examples are: MIS-DOS (PC-DOS), VSE and S/3X SSP or CPF. System/3X users are fairly vocal about their disdain for SAA as it leaves them in a lurch. DTOT believes that IBM has a reasonable upgrade path in the highly publicized SILVERCAKE due in the summer of 1988.

3) Not all languages

All the current popular languages are not supported

For example RPG II and RPG III on the System 36 and System 38 environments is not supported. This suggests that SAA is built for future direction. Also not covered in SAA are PL/1, APL and Basic. However a surprise language that is covered is C the basic language in UNIX an operating system environment that has been lackluster for IBM. INPUT believes that is likely to change. [See Futures discussion in Chapter V]

4) Networking limitations

In spite of all the time and effort that has gone into SNA, which is embedded in large measure in SAA, there are some networking limitations. Exhibit III-3 lists these limitations. The lack of specification or supporting the vendors equipment is a key factor in network cooperation.

3) INITIAL LACK of DOCUMENTATION

When SAA was announced on MARCH 17, 1987 there was no documentation on IBM SYSTEMS JOURNAL to provide a basis for the major strategy and direction being expressed. This lack of "academic" substance got SAA off to a slow start. Some documentation was available in MAY, 87 (the architect of an overview manual), most substantial documentation is now available.

SAA would be more believable had there

Exhibit IV-3

SAA SHORTFALL
Networking Limitations

- NetView support
- Network MANAGEMENT for foreign EQUIPMENT
- Communication Standards
  - Except X.25 and OSI
- DDM and ECF not clear

been a research-oriented paper or blueprint available

6) No CASE or DATA DICTIONARY

Also conspicuous by its absence is the lack of an applications development tool or CASE-type product. Also there is no DATA DICTIONARY tool support to track the functional and business definitions in an organization. Also missing were tools for change control/change requests/and audit trail. Input believes this is an important shortfall as it will limit the ability of corporate development to easily stay within SAA guidelines. Input believes that IBM will announce a CASE capability by 3rd QTR 1988.

I) SAA - FUTURE POSSIBILITIES

Input forecasts it will take several years for the full functionality of SAA to settle out and reach steady state. Based on how IBM is releasing support for SAA in each of its major platforms it is unlikely that major application software systems will be developed before the early 1990s.

However the very first signs of IBM's commitment to SAA are likely to be observed in mid-88 when both OS/2 Extended and Silverlake are made available. Advance information indicates the support for SAA conventions, products and protocols will be quite good. IBM will be announcing the first

or "office/3x"

SAA application being called "SAA office" based on the office to work in ASD. In addition several industry-specific applications are expected with the Silverlake announcement:

Constructor's Management Accounting System (CMAS)
Distributors Management Accounting System (DMAS)
Manufacturing Accounting and Production Information Control System (MAPICS)

These applications were extremely successful in the S/3x products and are believed to have been ported to Silverlake as opposed to be written from scratch. It is expected these applications will be reworked to conform with SSA conventions.

Two very important program products that were not originally part of SAA are likely to be included (or added) in the near future. These are UNIX and a CASE TOOLS KIT. (probably based on CSP)

1) UNIX

While IBM has chosen "C" as one of its united programming language capabilities it is noteworthy that IBM did not select UNIX as an operating system environment. There is no doubt that UNIX has been having more success in the general marketplace. All one need to note is the growth of Sun, UNISYS' UNIX systems, the government POSIX requirement to see that UNIX is an important OS.

The fundamental reason that DIDT believe,

due to its inability to control the UNIX standard. However that is subject to change based on the recent announcements of the newly formed OPEN Software Foundation (OSF) to sponsor an open version of UNIX and associated tools. Each of the founding OSF members has agreed to provide up to $4.5 million per year over the next 3 years, a total of over $40 million.

The OSF was formed as a direct result to the Sun/ATT relationship. The OSF founders felt that the Sun/ATT relationship would provide Sun with a distinct advantage in pursuing the UNIX market due to the advance information and insight they would receive as the contributing developer to the next UNIX version. ATT by itself was never viewed as having that develope advantage because it lacked any penetration or success as a hardware vendor. However the equity relationship and develope relationship with Sun tilted the balance and caused considerable concern on the part of Apollo, DEC and H.P Exhibit X-1 shows the OPEN Software Foundation's initial founders and the technology they are licensing to the OSF.

The most pivotal contribution is a future release of IBM's AIX which will be the foundation for the efforts of the OSF partnership. This being the case makes the likelihood of UNIX joining the SAA product family highly likely. After all IBM will be able to exert some influence on the OSF group and that would mitigate the main reason for not including UNIX in SAA to begin with.

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Exhibit

OPEN Software Foundation
Founders and Technology

Please Bold all the company names

Apollo Computer
- Network Computing System
- OPEN Dialogue

Groupe Bull
- UNIX multi-processor Architecture
- Software Development Tools
- On-Line TRANSACTION PROCESSING
- OSI Software Support

Digital Equipment
- USER INTERFACE TOOLS
- APPLICATION DATA Interchange FORMATS

Hewlett Packard
- National Language Support
- DISTRIBUTED UNIX System
- Real-time expertise
- NewWave - presentation Formats

IBM
- Future AIX release

NIXDORF Computer, AG
- Distributed Relational Database
- Network Management

Siemens, AG
- Communications
- USER INTERFACE
- TRANSACTION PROCESSING
- Compilers

2) CASE TOOLS

As mentioned in the previous section IBM is expected to add capabilities and functionality to its Application generator (CSP) to make it more competitive and acceptable as a CASE product. CASE (Computer-aided Software Engineering) is the ~~new~~ fast growing software products niche that has come into its own in the past couple of years. Leading independent vendors are Index Technology, Texas Instruments, WIASTEC and Knowledgeware while IBM's Cross ~~Ref~~ Systems Productivity is available to somewhat meet the needs of CASE users it falls short in several respects.

Input believes that IBM will add to CSP ~~with~~ internally developed enhancements as well as some external ~~third~~ 3rd party tools. This has been a significant part of how the CASE market has been shaping up with the independent vendors teaming with ~~to~~ other CASE vendors to offer a more complete CASE offering.

A Case tool kit is key to the SAA access to facilitate internal applications development by IBM clients. Providing CASE front-end to back-end tools will be an important element in easing the IBM client into the SAA environment

3) 3270 replacement

The new wave of PS/2 announcements (June 1988) makes it even more clear that the PS/2 family will become a suitable

replacement for 3270-type terminals in the next few years. The anticipated functionality of OS/2 Extended and the connectivity tools thereon will allow users to more effectively use the PS/2 in 3270-type applications. It is apparent that one major long-range goal of SAA is the desire by IBM to become more oriented toward intelligent workstations for distributed processing requirements.

J. SAA Competition

SAA in some sense has no competition from the other hardware manufacturers. Digital Equipment, UNISYS, Hewlett-Packard, NCR do not have an extensive marketing/sales/engineering program to describe a corporate commitment to a homogeneous application environment. On the other hand there is little need to have this because these other manufacturers for the most part have not had the confused, disparate hardware and software strategy ~~that~~ to which IBM had evolved to.

Most of the these vendors have had an SAA-like strategy they used that provided upwards migration with little difficulty. DEC for one has had a myriad of product that spanned quite a computing spectrum which were supported by the same O/S i.e. VMS and applications. Obvious limits to applications portability are memory and storage constraints and quite possibly user responsiveness and access.

In fact DEC has implemented DECNET which can support IBM's SNA extremely well. Some industry analysts believe DEC can support portions of SNA better than IBM itself. DEC has announced Network Application Support. ~~DECS~~

i) DEC's Network Application Support (NAS)

DEC has never articulated its applications architecture or environment it merely evolved into an environment where its customers could easily upgrade and have the same ~~demand~~ applications available as their ~~needs~~ resource requirements changed. However, perhaps as a response to SAA and prodding of industry Consultants DEC has spent a little marketing effort to articulate NAS. NAS is a comprehensive integration strategy to achieve application compatibility across all systems deemed "important to our customers." It is part ~~consists~~ of a three prong program to achieve applications compatibility through the use of:

- VAX/VMS OS architecture, which has been protected and implemented as a vehicle to provide computing capability across DEC's hardware.
- DECNET (now called DECnet/OSI) to provide connectivity
- NAS - products designed to provide multivendor communication services in three basic areas:
  - application access service
  - business communication services
  - information/resource sharing service

network world
1/25/88

As part of this strategy DEC entered into a strategic alliance with Apple to provide support for MACintoshes and DEC environments. DEC also supports Cooperative processing applications that run on IBM PCs

2) Other Vendor Views

Input's survey of leading hardware manufacturers yielded a consensus opinion that expressed the feeling that IBM's SAA efforts were long overdue. IBM is validating implicit corporate strategy they have been proceeding against for many years

while on one hand they should feel that IBM has covered up a weakness in solving the migration difficulties on the other they expressed the belief that they ~~know~~ now know what they are up against.

Software vendors are interested in developing their software for the SAA environment to obtain the same benefits that IBM is looking for in economies of scale for development, documentation and product marketing. Some software vendors that have avoided porting or moving functionality from IBM mainframe environments will now be taking a hard look at how to downscale their software.

V Conclusions

IBM has "stolen a march" on its competitors by embarking on a application software Consistency program called SAA which will re-structure the software industry. Exhibit V-1 expresses Ingot's belief on what SAA is in terms of the marketplace.

IBM is very committed to users, vendors and the industry in general in bringing out the SAA concept. Whatever the genesis and planning that may have or may not have taken place prior to the official announcement of March 17, 1987 the fact remains that SAA is real, significant, expensive and an opportunity.

This leads to conclusion #1: **SAA will re-shape the Software Products market.**

Bold

As one industry individual put it, "IBM does not always make the correct decision, but it makes its decision correct." The point is it is sour grapes to claim that SAA is not the result of elegant planning with a crisp methodology and definition skillfully executed, announced and implemented. It is SAA, it provides a direction and commitment and throwing immense amounts of resource at proselitizing the world will (with much behind the scene effort) make it work

So to say what it could have been or what

Exhibit IV-1

SAA Conclusions

SAA IS:

- REAL
- Significant
- Expensive
- An OPPORTUNITY

Result: Re-Shape the Software Market

it does not contain only delays the inevitable. The inevitable is that IBM's users, competitors and strategic alliances will have to deal with it.

~~The following conclusions~~

SAA will have several noticeable effects over the next few years. These effects are listed in exhibit V-2 and discussed below.

A) PRODUCT CONSOLIDATION

SAA will force a consolidation of products based on the number of vendors that will automatically be competing once SAA is available across all IBM platforms. This will be caused by the fact that each application vendor that previously had to choose a hardware platform will now have its application available across all IBM platforms.

This will force ~~so~~ application software vendors (including IBM) to develop applications that are better, offering more functionality and support to meet the needs of the users thus users win!

B) USER Requirement

It is Input's belief that user's will demand that applications vendors provide (for the IBM environment) SAA compliant products and tools. SAA and compliant products offer users the benefits of an improved operating environment.

Users will benefit from reduced development expenses more efficient training expenditures and increased competition

Exhibit V-2
SAA Conclusions

SAA WILL &

- DRIVE PRODUCT Consolidation
- BE A USER Requirement
- DRIVE New Applications / PRODUCTS
- DRIVE SOFTWARE PRICING
- Re-Shape the SOFTWARE INDUSTRY

for their dollars.

c) New Products

Due to the increased competition DPCT is forecasting that application software vendors will look for new niches and applications to sell. In addition, with interfaces known and well-documented it is likely that there will be more ~~inter~~ multi-vendor application systems developed that will feature cooperative processing features.

Searching for new applications will cause the creative developers to be forced to automate still more sophisticated aspects of the business. This driving market force is complemented by the availability of significantly more processing power and complementary resources to continue to drive the user interface to be as "friendly" as possible

d) Software Pricing

as the competition intensifies it will be difficult to hold the prices up or increase them (for a given function so to speak). The weaker vendors are likely to drop prices in an effort to maintain a revenue basis and/or market share. Revenues will be slightly impacted and overall there will be gains due to significantly increased unit volumes being shipped. Software pricing will continue in the same vein with IBM continuing graduated pricing strategies.

In addition it is Input's opinion that a

shift in pricing will occur whereby IBM will emphasis purchase versus rental/lease to maintain a sense of continued profitability. This is similar to the change of purchase versus rental mix in the early 1980s where purchase was emphasized.

E) IBM Dominance

While SAA may seem like not as much thought went into it as could have the fact remains it is here (or virtually so). As stated previously IBM is going to make SAA the type of success SNA finally became by spending enormous amounts of its senior management time and dollars. SAA is part of a major strategic direction by IBM to dominate the applications software market.

IBM currently enjoys software at approximately 13% of worldwide revenues. The to majority of IBM's growth in 1987 can be attributed to the growth in software products. It is left to the reader to decide what the implications are.

VI Recommendations

The previous chapters of the report described the motivation ~~key~~ behind SAA, the content of SAA and the issues and driving forces for SAA. In addition ~~estimates~~ forecasts, were provided on the acceptance of SAA, product time table and conclusions. This section describes recommendations that Input suggests other vendors in the Information Services industry might employ to take advantage of SAA as an emerging opportunity. SAA will not go away.

Exhibit VI-1 lists the INPUT recommendations which are discussed in the subsequent paragraphs

A) Accept SAA

Input recommends that vendors or 3rd parties that are impacted by SAA learn to live with it. There are some that seem to be resisting the obvious consequences which only make them more frustrated. Accepting SAA does not mean putting your head in the sand but rather becoming knowledgeable and learning how to take advantage of the ramifications of SAA

B) Differentiate your Products

While this is clearly a motherhood and apple pie type statement once you accept SAA you need to develop a business strategy that make you different from the others. It could be additional functionality, more performance, more users, multivendor integration, strategic alliances, support, price, etc. IBM can not do

Exhibit VI-1

SAA -
Recommendations

- ACCEPT SAA
- DIFFERENTIATE YOUR PRODUCTS
- EVALUATE MULTI-VENDOR OPPORTUNITIES
- INVESTIGATE WORKING WITH IBM

everything itself.

c) Evaluate Multi-vendor opportunities

This recommendation concerns the attempt to find ways to tie multiple hardware vendor platforms together through some cooperative processing technique. This will provide a value-added capability that is unlikely to be found in the IBM repertoire. It would be extremely aggressive and courageous if IBM itself would attempt multi-vendor application functionality but DATAPRO believes this is unlikely. Shifting the IBM Corporation from hardware to ~~people~~ software products emphasis is a bold enough change to contemplate

d) Investigate working with IBM

As mentioned earlier in the report IBM has set up ASD to develop applications both through internal programs and through external 3rd party relationships. Since IBM can not be all applications to all industries it seems clear that working with IBM is better than not working with IBM (Just do not ask Hogan Systems). DATAPRO recommends that vendors explore what meaningful working relationship might mean.

In Summary SAA will be a success. Vendors and users need to determine how to participate

Appendix A

SAA Documentation

SAA was officially announced on ST. PATRICK'S DAY 1987 after several months of leaks to the press. At the announcement there was no documentation available. The general reaction in the press and through the IS industry was one of cautious enthusiasm.

An overview manual was available in MAY, 1987 which was updated in September, 1987. It's official IBM document number is GC26-4341-1 and it is entitled "Systems Application Architecture – An Overview"

Other SAA documentation that ~~is~~ available is described in the following manuals:

SAA Component	Document Name	Document #
Common Programming Interface	Application Generator Reference	SC26-4355
	C Reference	SC26-4353
	Cobol Reference	SC26-4354
	Database Reference	SC26-4348
	Dialog Reference	SC26-4356
	Fortran Reference	SC26-4357
	Presentation Reference	SC26-4359
	Procedures Language Reference	SC26-4358
	Query Reference	SC26-4349
Common User Interface	SAA Common User Access: Panel Design and User Interaction,	SC26-4351
General programming advice	SAA Writing Applications: A Design Guide	SC26-4362

Appendix B

SAA Products
Common Communications Interfaces

	MVS/XA	VM/CMS	OS/2	S/3X (Silverlake)
DATA STREAMS:				
3270 DATA Stream	TSO, GDDM	CMS, GDDM	PC 3270 emulation	C
IPDS PRINTER DATA Stream	PSF	PSF	C	C
Document Content Architecture	DW/370	DW/370	DW 4/2	C
Application Services:				
SNADS DISTRIBUTION	DISOSS	C	C	C
Document Interchange	DIBOSS, PS/370	C	PS/PC	C
Network Management Architecture	NETVIEW	NETVIEW	OS/2 1.1E	C
Session Services:	ACF/VTAM 3.2	ACF/VTAM 3.2	OS/2 1.1E	C
APPC LU6.2				
Networking:				
LEN Low-Entry	ACF/VTAM 3.2-NCP	ACF/VTAM 3.2-NCP	C	C
DATA Link Control:				
SYNCHRONOUS DATA Link Control	ACF/VTAM-NCP	ACF/VTAM-NCP	OS/2 1.1E	C
TOKEN-RING NETWORK	ACF/VTAM-NCP	ACF/VTAM-NCP	OS/2 1.1E	C
X.25	ACF/VTAM-NCP-NPSI	ACF/VTAM-NCP-NPSI	OS/2 1.1E	C

Notes:
OS/2 1.1E = OS/2 release 1.1 Extended, Announced but no delivery date
C = SAA Compliance expected in a future announcement.

ABBREVIATIONS
ACF/VTAM = ADVANCED COMMUNICATIONS FUNCTION/VIRTUAL TELECOMMUNICATIONS ACCESS METHOD
DIOSS = DISTRIBUTED OFFICE SYSTEM

SAA PRODUCTS
Common Programming Interface

	MVS/XA	VM/CMS	OS/2	S/3X (Silverlake)
Languages:				
COBOL '85	COBOL II	COBOL II	COBOL/2	I.C C
FORTRAN '77	VS FORTRAN	VS FORTRAN	FORTRAN/2	I.C C
C	C(0)	C(0)	C/2	C
APPLICATIONS GENERATOR	CSP/AD, CSP/AE	CSP/AD, CSP/AE	EZ-RUN	I.C C
PROCEDURES LANGUAGE	I.C C	VM/SP (REXX)	I.C C	I.C C
SERVICES:				
DATABASE INTERFACE (SQL)	DB2	SQL/DS	OS/2 1.1 EXTENDED	I.C C
QUERY MANAGEMENT INTERFACE	QMF	QMF	OS/2 1.1E	I.C C
DIALOG INTERFACE	ISPF	ISPF	OS/2 1.06	I.C C
PRESENTATION INTERFACE	GDDM	GDDM	OS/2 1.06	I.C C

Notes:

OS/2 1.1E = OS/2 release 1.1 EXTENDED; Announced but no delivery date

I.C.→C = SAA Compliance expected in a future announcement

ABBREVIATIONS

CSP/AD = CROSS SYSTEM PRODUCT / APPLICATION DEVELOPMENT

CSP/AE = CROSS SYSTEM PRODUCT / APPLICATION EXECUTION

VM/SP = VIRTUAL MACHINE / SYSTEM PRODUCT

QMF = QUERY MANAGEMENT FACILITY

ISPF = INTERACTIVE SYSTEM PRODUCTIVITY FACILITY

GDDM = GRAPHICAL DATA DISPLAY MANAGER

DB2 = DATA BASE 2

SQL/DS = STRUCTURED QUERY LANGUAGE / DATA SERVICES

DW/370 = DISPLAYWRITE/370
DW 4/2 = DISPLAYWRITE 4/2
NCP = Network Control Program
NPSI = Network Packet Switching Interface
PS/PC = Personal Services /PC
PSF = Print Services Facility